

SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE
OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION
FOR THE ADVANCEMENT OF SCIENCE.

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FRIDAY, MARCH 8, 1901.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE CASE OF PROFESSOR ROSS.

IN view of the interest excited in academic and scientific circles by the circumstances connected with the dismissal of Professor Ross from Stanford University, we publish in full the report of the committee of San Francisco Alumni and of a committee of economists. It will be observed that they come to exactly opposite conclusions. The alumni maintain that the dismissal of Professor Ross did not infringe on the right of free speech, while the economists side with Professor Ross in his claim that he is a martyr. It may seem ungracious for men of science, who have in the past suffered for truth's sake and have won the right to free scientific investigation, not to take sides with their colleagues in sociology and economics when they unite to urge the right of academic freedom. But we can not escape the conviction that the report of the three economists is a partisan rather than a judicial document.

A distinction must be made between freedom of speech and license of speech, between the right to investigate and the desirability of using a university as a point of vantage for propagandism. Our universities should be conservative—they should

be careful in the appointment of professors and doubly careful in their dismissal. But the freedom of the individual must be subordinate to the freedom of the university. Academic freedom is the right to speak academically, and the university professor not only enjoys privileges, but also undertakes obligations.

There is no reason why as an individual Mr. Ross should not have supported by illustrated pamphlets and stump speeches free silver and Mr. Bryan in the campaign of 1896, but he should not have done so to the injury of the university. Professor Ross's methods of treating social problems may be illustrated by an extract from an article published by him the month of his dismissal. He writes in the *American Journal of Sociology*:

A predatory minority, then, presents itself at first as a governing class that by its toils, cares, and risks contrives to draw to itself the surplus goods of the governed. But, at a later stage of development, enjoyment and control are no longer vested in the same persons. The anatomy of a parasitic organization now shows at the center certain idle enjoyers surrounded by a great number of unproductive laborers who share in their spoil, and who in return busy themselves, as retainers, mercenaries, police, priests, teachers, or publicists, in intimidating, cajoling, or beguiling the exploited majority.

As President Jordan has stated, Professor Ross has many admirable qualities and his extravagances were long born with. If we understand the matter correctly President Jordan fully concurred with Mrs. Stanford in recognizing Professor Ross's disabilities, but wished to avoid the publicity which has been brought on the university. There is no doubt but that Professor Ross has shown his unfitness for an academic

position by the way he has acted since presenting his resignation to President Jordan. He said he resigned because "I am unwilling to become a cause of worry to Mrs. Stanford or of embarrassment to you." As soon as the resignation was accepted, which was done in as kind a way as possible, he does all he can to annoy Mrs. Stanford, to embarrass President Jordan and to injure the university.

The fact that Mrs. Stanford has recently given twenty-seven million dollars to the university and has retained for the present the rights that will later devolve on a board of trustees makes it somewhat easy to attack the university, but puts heavy responsibility on those who carry on such an attack. We are aware of the dangers due to the fact that many of our institutions are supported by rich men and to a certain extent controlled by them. But an impartial review of the history of university development in America shows that great tolerance has been allowed to university professors. The call of President Andrews and Professor Ross to a university supported by a State and controlled by a political party seems to be more dangerous for academic freedom than their dismissal from other universities. But on the whole there is no valid reason to criticize either our privately endowed or our State universities on the ground of suppression of legitimate freedom of speech.

REPORT OF THE COMMITTEE OF SAN FRANCISCO ALUMNI.

Your committee elected at the meeting of the association held November 20, 1900, to ascertain the confidential and other reasons

for Dr. Ross's enforced resignation begs leave to report:

That inasmuch as those interviewed, on both sides, have stipulated that the detailed information received should be treated as confidential, your committee is able to report only the ultimate facts. These are as follows:

First. Mrs. Stanford shared in the opinion general in university circles in 1896 that Dr. Ross's pamphlet entitled 'An Honest Dollar,' illustrated by political cartoons, signed by him as 'Professor of Economics in the Leland Stanford Jr. University,' and published and circulated by one of the political parties during the campaign of that year, was undignified in its form and manner of treatment, and that it was unwise in the point of the time and manner of its publication, because jeopardizing the University's right to a reputation for political non-partisanship. This incident, together with Dr. Ross's general conduct throughout that campaign, was deemed by Mrs. Stanford a symptom of unfitness for the responsible position of head of the economics department of the University.

Second. The justness of the criticism then expressed must be deemed to be conceded by Dr. Ross, since it has been admitted by him to your committee that he would not again pursue the same course under similar circumstances.

Third. Your committee is unable to find that Mrs. Stanford's objection arose because Dr. Ross's opinion differed from her own, since it is in evidence that she had at that time no opinion upon either side of the particular financial theories then in issue, and since she has not abandoned her objection to his conduct in the campaign of 1896, although his views upon the silver question thereafter radically changed.

Fourth. That from December, 1896, when Dr. Ross's chair was changed from economics to social science, until the time

of his dismissal his position in the University was probational.

Fifth. That the want of confidence engendered by the incidents of 1896 was never removed from Mrs. Stanford's mind, but was accentuated by other incidents impairing her faith in his good taste and discretion. Among these your committee has found: The use of slang in his public and classroom lectures, brought to her attention by friends present, and by lampoons in the college annuals, and reports that his classroom lectures contained references derogatory to her deceased husband.

Sixth. Your committee has been unable to find any evidence that Mrs. Stanford ever took exceptions to Dr. Ross's economic teachings.

Seventh. That her ultimate demand for his resignation was not due to opinions expressed in his speeches on 'Coolie Immigration' and the 'Twentieth Century City,' but was because she deemed that her original estimate had proved correct, and that he was redisplaying, after three years of trial, those qualities found objectionable in the instance of her original action.

In passing upon the question whether Mrs. Stanford's action involved any abridgment of the right of free speech, your committee has considered very carefully the published statement of Dr. Ross, and the proofs upon which it is founded. In deliberating upon these, however, your committee has been unable to escape the force of the following facts:

First. Dr. Ross was not in the position of one able to remain in the University who chose to resign, but of one who, willing to remain, was forced to resign. His statement, therefore, necessarily attempted to tell Mrs. Stanford's reasons for forcing him out and not his own for going; hence it cannot have the probative force of his own reasons for his own acts.

Second. Dr. Ross's statement ignores the

criticism arising from his conduct during the campaign of 1896; notwithstanding that he knew at the time of publishing his statement that it was one of the operative reasons for his dismissal.

Third. The established fact that Dr. Ross desired to remain at Stanford, notwithstanding Mrs. Stanford's criticism, is inconsistent with the theory that he really regarded those criticisms as involving any abridgment of his right of free speech.

Fourth. The admission of Dr. Ross to your committee that he would not regard a university rule against the participation in politics by a university professor of economics during the progress of a political campaign as impairing the proper right of academic freedom, disposes of his contention that the criticism of his conduct in 1896 is capable of that construction.

From the foregoing facts and upon the testimony as a whole, your committee concludes that the action of Mrs. Stanford in asking the dismissal of Dr. Ross involved no infringement of the right of free speech.

REPORT OF A COMMITTEE OF ECONOMISTS.

The committee, appointed at the meeting of the economists in Detroit, December 28, 1900, to enquire into the cause of the dismissal of Professor Ross from Leland Stanford University, has earnestly endeavored to learn the facts of the case. In addition to a careful examination of the statements made in the newspapers, we have asked Professor Jordan for a full and frank statement of the causes which led to Professor Ross's removal, and have obtained the replies printed in the appendix, in which Professor Jordan declines to give specific information in regard to them. We have also in our possession copies of letters bearing upon this case from various persons, including letters from Professor Ross, as well as from President Jordan, not only to Professor Ross, but also to others.

The following facts are, we believe, undisputed:

It is customary for professors in the Leland Stanford University to be reappointed early in May of each year. Professor Ross failed to receive his annual reappointment early in May, 1900. He was, however, reappointed on June 2d. On June 5th, he handed to President Jordan his resignation as follows:

Dear Dr. Jordan: I was sorry to learn from you a fortnight ago that Mrs. Stanford does not approve of me as an economist, and does not want me to remain here. It was a pleasure, however, to learn at the same time of the unqualified terms in which you had expressed to her your opinion of my work and your complete confidence in me as a teacher, a scientist and a man.

While I appreciate the steadfast support you have given me, I am unwilling to become a cause of worry to Mrs. Stanford or of embarrassment to you. I, therefore, beg leave to offer my resignation as professor of sociology, the same to take effect at the close of the academic year, 1900-1901.

This resignation was not acted on until November 12th, when it was accepted by President Jordan in the following letter:

I have waited till now in the hope that circumstances might arise which would lead you to a reconsideration. As this has not been the case, I, therefore, with great reluctance, accept your resignation, to take effect at your own convenience. In doing so I wish to express once more the high esteem in which your work, as a student and a teacher, as well as your character as a man, is held by all your colleagues.

On November 14th, Professor Ross authorized the publication in the newspapers of a statement setting forth the causes of his resignation and its acceptance, attributing it to a dissatisfaction felt by Mrs. Stanford with his expressions of opinion on questions of public policy, particularly Coolie Immigration and Municipal Ownership of public service corporations. On the following day, President Jordan wrote Professor Ross to the effect that, in view of his published statement, it was desirable that

his connection with the University should terminate immediately.

The evidence which we have been able to obtain indicates clearly also the following facts :

1. The causes which led to the dismissal of Professor Ross existed in May, 1900.

2. Although the dismissal of Professor Ross may have been occasioned by his published statement of November 14th, his resignation was practically forced by the wish of Mrs. Stanford. This fact is distinctly stated in the report of the Alumni Committee of Investigation which report apparently has the full endorsement of the University authorities.

3. Mrs. Stanford's wishes in the matter were expressed as early as May, 1900.

4. The delay in the acceptance of Professor Ross's resignation was due to an effort on the part of Professor Jordan to overcome Mrs. Stanford's objections.

The question in regard to which we have been called upon to express an opinion is : What were the reasons which led Mrs. Stanford to force Professor Ross's resignation ?

Two classes of reasons have been alleged :

1. Dissatisfaction on the part of Mrs. Stanford with Professor Ross's expressions of opinion on questions of economic policy, notably in regard to the free coinage of silver in the campaign of 1896, and more recently in regard to coolie immigration and municipal monopolies.

2. It has been asserted or suggested that Professor Ross had made statements before his classes reflecting upon Senator Stanford, that he had shown himself selfish and lacking in loyalty to the University, that he was erratic and frequently overstepped the bounds of academic propriety in the manner of giving expression to his opinions, that his publication of November 14th was a violation of confidence, and that

there are facts which, if disclosed, would reflect upon his personal character.

While it is, of course, impossible for us definitely to determine what facts, or reports of supposed facts, may have weighed with Mrs. Stanford, the evidence in the possession of the committee seems to justify the following conclusions :

1. There is no evidence to show that Professor Ross gave occasion for his dismissal by any defect in moral character. On the contrary, President Jordan states in his letter of February 7th to the committee : " No ground exists for any interpretation of his dismissal reflecting on his private character."

2. There is no evidence to show that Professor Ross gave occasion for his dismissal by incompetence. On the contrary, President Jordan stated in a letter of May, 1900, that he was a ' careful thinker and a patient investigator ' ; ' a constant source of strength ' to the University and ' one of the best teachers, always just, moderate and fair.'

3. There is no evidence to show that Professor Ross gave occasion for his dismissal by any unfaithfulness in the discharge of his duties. On the contrary, President Jordan stated in a letter of May, 1900, that ' he has been most loyal, accepting extra work and all kinds of embarrassments without a word of complaint,' and that he was ' a wise, learned and noble man, one of the most loyal and devoted of all the band ' at the University.

4. There is no evidence to show that in his published statement of November 14th Professor Ross violated any confidence reposed in him. On the contrary, in a letter of December 24th, President Jordan states : " I wish after conversation with Dr. Ross to withdraw anything I may have said implying that he had knowingly used confidential material, or in any other way violated personal proprieties in making his statement."

5. Concerning the point that Professor Ross gave occasion for his dismissal by remarks derogatory to Senator Stanford, your committee finds in a statement by Mr. C. F. Lummis, in *The Land of Sunshine*, dated Christmas, 1900, the following passage:

The precise words Professor Ross may have used I do not know, but I do know that he has stated in his classes in Stanford many things which his students understood to be reflections on Senator Stanford, and I know also that Mrs. Stanford firmly believes that he did slur her husband's memory.

In *The Independent* of February 7, 1901, Mr. Lummis repeats this charge, quoting Mrs. Stanford's reasons for his dismissal: " * * * He has called my husband a thief."

The committee also finds that President Jordan in a letter of November 16, 1900, states:

Mr. Keesling informs me that he and others of the alumni have heard you in your classes condemn the means by which Mr. Stanford became rich in such a way as to make it clearly a personal reference, and that some time last year Mrs. Stanford was told this by a prominent alumnus, Mr. Crothers, if I understood correctly.

In a letter of the next day, however, President Jordan retracts this by saying: "Mr. Crothers tells me that he has never mentioned the matter in question to Mrs. Stanford. I was not sure that I understood my informant to say so."

Professor Ross, moreover, at the time, unqualifiedly denied all such charges, and insisted that statements to this effect were 'a thorough-paced falsehood and a disingenuous attempt to befog the real issue.' In another place he says: "The charge from any quarter that I have ever made remarks derogatory to the character of Senator Stanford is false—absolutely without foundation." In a subsequent letter he states: "I have never referred in a derogatory way to Senator Stanford, nor have I reflected upon the manner in which he accumulated his fortune. Both my sincere respect

for the Senator and my sense of the proprieties of my position forbade anything of the kind."

Moreover, that this charge could not have been a determining cause in President Jordan's acceptance of Professor Ross's resignation, is shown by the fact that in a letter of November 16th, two days after his dismissal, President Jordan says, in reference to these charges: "I never heard anything of the sort before."

6. There is no evidence to show that in the opinion of the President of the University, Professor Ross, in his utterances on the silver question, on coolie immigration, or on municipal ownership, overstepped the limits of the professorial propriety. On the contrary, President Jordan stated in May, 1900, that his remarks on coolie immigration and on municipal ownership were in accord with the drift of public sentiment on those subjects, and that even on the silver question 'he never stepped outside of the recognized rights of a professor.'

7. There is evidence to show:

(a) That Mrs. Stanford's objections to Professor Ross were due, in part at all events, to his former attitude on the silver question, and to his utterances on coolie immigration and on municipal ownership; and

(b) That while the dissatisfaction of Mrs. Stanford due to his former attitude on the silver question antedated his utterances on coolie immigration and municipal ownership, her dissatisfaction was greatly increased by these utterances.

As to (a). This is shown by the fact that President Jordan at first attempted to deter Mrs. Stanford from taking any action for such reasons, stating in a letter of May, 1900: "I feel sure that if his critics would come forth and make their complaints to me in manly fashion I could convince any of them that they have no real ground for complaint." President Jordan, moreover,

intimated that to dismiss him for such reasons would be improper in the extreme, for 'no graver charge can be made against a University than that it denies its professors freedom of speech.'

As to (b). This is shown by the fact that not until immediately after the delivery of the coolie immigration speech did Mrs. Stanford force Professor Ross's resignation as well as by the fact that in a letter of June, 1900, President Jordan stated: "The matter of immigration she (Mrs. Stanford) takes most seriously."

In the same letter, while Mrs. Stanford's objection is declared to be due to the fact that the reputation of the University for serious conservatism is impaired by the hasty acceptance of social and political fads, it is added, that these 'local criticisms' which weighed with Mrs. Stanford 'unfortunately are based on chance matters and *obiter dicta* not at all upon your serious work.'

We have not deemed it wise to publish in full the letters upon which we have based our conclusions, but we stand ready to publish them if such a course is necessary to establish the truth in this matter.

We are aware that, owing to the failure of President Jordan to give definite replies to all our questions, there may be important facts with which we are unacquainted. On the other hand, we cannot but feel that a refusal to furnish specific information in a case of such importance—in which it is charged that the freedom of speech is at stake—is itself a fact of significance, which, to say the least, is much to be regretted.

All of which is respectfully submitted.

EDWIN R. A. SELIGMAN Professor of Political Economy and Finance, Columbia University.

HENRY W. FARNAM, Professor of Political Economy, Yale University.

HENRY B. GARDNER, Professor of Political Economy, Brown University.

February 20, 1901.

The undersigned have examined the evidence submitted by the above committee, and believe that it justifies the conclusions which they have drawn.

HORACE WHITE, Editor of the *Evening Post*, New York.

JOHN B. CLARK, Columbia University.

HENRY C. ADAMS, University of Michigan.

FRANK W. TAUSSIG, Harvard University.

RICHARD T. ELY, University of Wisconsin.

SIMON N. PATTEN, University of Pennsylvania.

RICHMOND MAYO-SMITH, Columbia University.

JOHN C. SCHWAB, Yale University.

SIDNEY SHERWOOD, Johns Hopkins University.

FRANKLIN H. GIDDINGS, Columbia University.

WILLIAM J. ASHLEY, Harvard University.

CHARLES H. HULL, Cornell University.

DAVIS R. DEWEY, Massachusetts Institute of Technology.

HENRY C. EMERY, Yale University.

HENRY R. SEAGER, University of Pennsylvania.

APPENDIX.

DECEMBER, 30, 1900.

PRESIDENT JORDAN,

*Leland Stanford Junior University,
Palo Alto, Cal.*

Dear Sir: In behalf of a considerable number of economists, recently assembled in Detroit and much interested in the resignation of Professor Ross from the Leland Stanford University, we venture to address you on the subject. We understand from the public prints as well as from other sources, that Professor Ross was asked to sever his connection with the University owing to the loss of confidence in him by Mrs. Stanford, and that this loss of confidence was due primarily to the opinions expressed by him in a lecture on the subject

of coolie immigration as well as to incidental remarks on the problems of municipal ownership.

May we inquire whether, as it has been alleged in some of the Eastern journals, there are any other reasons than those mentioned for the resignation of Professor Ross, and may we hope that, if such other reasons exist, you may be disposed to communicate them to us? Many university men have been led to believe that in this case the legitimate freedom of thought without which no progress in science is possible has been discouraged. As this is a matter which concerns not a single university, but the interests of scholarship all over the country, we believe that we are not overstepping the bounds of propriety in asking information which will enable university teachers to form a just opinion on the merits of the case.

We desire to add that Dr. Ross is neither the instigator of this letter nor aware of its contents. Very truly yours,

EDWIN R. A. SELIGMAN,
Columbia University.
HENRY W. FARNAM,
Yale University.
HENRY B. GARDNER,
Brown University.

LELAND STANFORD JUNIOR UNIVERSITY,
STANFORD UNIVERSITY, Cal.,
January 7, 1901.
PROFESSOR EDWIN R. A. SELIGMAN,
Columbia University, New York City.

My Dear Sir: In response to your kind letter of December 30th, permit me to say that in view of the importance of the matter I have referred the contents of your letter to a committee of three of our professors, Vice-President J. C. Branner, Dr. J. M. Stillman and Dr. C. H. Gilbert. They are in possession of the facts and are at liberty to answer any questions which your committee may desire to ask. For reasons

which will readily appear it has not been deemed advisable for us to state the reasons why Dr. Ross was dismissed. His statement to the press does not assign any of the true reasons. Very truly yours,

DAVID JORDAN,
President.

LELAND STANFORD JUNIOR UNIVERSITY,
January 14, 1901.

PROFESSOR EDWIN R. A. SELIGMAN,
PROFESSOR HENRY W. FARNAM,
PROFESSOR HENRY B. GARDNER.

Dear Sirs: Your letter of December 30th addressed to President Jordan has been referred by him to us for reply.

In your letter you say: "We understand from the public prints as well as from other sources that Professor Ross was asked to sever his connection with the University owing to loss of confidence in him by Mrs. Stanford, and that this loss of confidence was due primarily to the opinions expressed by him in a lecture on the subject of coolie immigration as well as to incidental remarks on the problem of municipal ownership."

In reply we beg to say that the dissatisfaction of the University management with Professor Ross antedated his utterances on the topics you refer to. His removal was not due primarily to what he published, said or thought in regard to coolie immigration or in regard to municipal ownership.

We can assure you furthermore that in our opinion his removal cannot be interpreted as an interference with freedom of speech or thought within the proper and reasonable meaning of that expression.

These statements are made with a full knowledge of the facts of the case.

Very truly yours,

J. C. BRANNER,
J. M. STILLMAN,
C. H. GILBERT.

January 30, 1901.

PRESIDENT JORDAN,
Leland Stanford University,
Palo Alto., California.

Dear Sir: We beg to acknowledge receipt of your letter of January 7th, as well as the letter of your committee of three, of January 14th.

You state in your letter that you are ready to answer all questions. May we venture to put the following:

1. In the committee's letter of January 14th, it is stated that the 'dissatisfaction of the University Management with Professor Ross antedated his utterances on the topics you refer to.' How can this dissatisfaction of the University management be made to agree with the statement of the President, speaking for himself and the faculty, and quoted in the public prints of November 14th as follows:

a.—Extract from a letter from Professor Ross to President Jordan: "It was a pleasure, however, to learn from you of the unqualified terms in which you have expressed to her (Mrs. Stanford) your high opinion of my work and your complete confidence in me as a teacher, a scientist, and a man."

b.—Quotation from a letter from President Jordan to Professor Ross: "I wish to express once more the high esteem in which your work as a student and a teacher, as well as your character as a man, is held by your colleagues."

2. In your letter of January 7th, you say: "His (Professor Ross's) statement to the press does not assign any of the true reasons." If the speeches on coolie immigration and municipal ownership did not constitute any of the reasons for his dismissal, why was the dissatisfaction, which in your judgment antedated these speeches, not manifested until immediately after the delivery of the same? Why was the reappointment so dubious and tardy while Professor Ross had no intimation of his possible non-appointment till May 18th?

3. In saying that Professor Ross does not assign any of the true reasons for his dis-

missal, do we understand you to deny the truth of Professor Ross's published statement, containing quotations from your remarks to him:

a.—That "he (Dr. Jordan) had heard from her (Mrs. Stanford) just after my address on coolie immigration."

b.—That "quite unexpectedly to him (President Jordan) Mrs. Stanford had shown herself greatly displeased with me (Professor Ross)."

c.—That "he (President Jordan) was profoundly distressed at the idea of dismissing a scientist for utterances within the scientist's own field."

d.—That "he (President Jordan) made earnest representations to Mrs. Stanford."

4. What are the real reasons for the dismissal of Dr. Ross? In your letter of January 7th, you say: "For reasons which will readily appear, it has not been deemed advisable for us to state the reasons why Dr. Ross was dismissed." Will you pardon us for saying that we fail readily to recognize any such reasons? If the reasons are that you fear to injure the personal reputation of Professor Ross, may we venture to suggest that nothing that you could do would be more calculated to injure Dr. Ross than the insinuation that there are some secret reasons which cannot be divulged. It is just because some such innuendoes have been printed in the papers that our committee addressed itself to you, in order to ascertain the true state of affairs.

While we regret to prolong this correspondence, you will readily see that unless we can give the members of the American Economic Association some explicit reasons for Professor Ross's dismissal other than those assigned by him, they will naturally adhere to the opinion based upon the statements first made in the public press. A mere denial of the truth of the statements made by him will not be apt to satisfy gentlemen who are not willing to believe that any of the parties concerned in the question would intentionally make a false statement, and facts alone will enable them

to reconcile assertions that would otherwise seem contradictory. It is for that reason that we venture again to express the hope that a more explicit answer may be given to our questions.

Very truly yours,

EDWIN R. A. SELIGMAN,
HENRY W. FARNAM,
HENRY B. GARDNER.

LELAND STANFORD UNIVERSITY, CAL.,

February 7, 1901.

PROFESSOR EDWIN R. A. SELIGMAN,
PROFESSOR HENRY W. FARNAM,
PROFESSOR HENRY B. GARDNER.

Gentlemen: Your letter of January 30th is at hand asking further information as to the reasons for the dismissal of Professor Ross. When I expressed my willingness to answer further questions I did not mean to indicate that I would enter into any circumstantial description of events leading to or following from Professor Ross's dismissal. Nor do I consider it expedient or proper to go into a discussion of extracts from my letters or conversations or of my statements or alleged statements, or those of others, as published in the newspapers. There are, however, certain assurances which it is within the privilege of the public to ask, and which it is my desire to furnish, that the public may be assisted in forming a judgment as to the position of the University upon important questions. It seems to me that I shall answer these questions best by certain plain statements which involve the important facts concerning the University. It will be necessary for you to assume my knowledge of all the facts, also that the interpretation herewith presented is authoritative from the University standpoint.

First. Professor Ross was not dismissed on account of his views on Oriental immigration nor on account of his opinion on any economic question.

Second. Professor Ross was dismissed

because in the judgment of the University authorities he was not the proper man for the place he held. The responsibility for the correctness of this judgment belongs to the University authorities and to them alone.

Third. No ground exists for any interpretation of his dismissal reflecting on his private character, of which your letter seems to imply a fear.

Fourth. The judgment that Professor Ross was not the proper man for the place he held is not incompatible with my appreciation of many good qualities he possesses, nor with my wishes or efforts at any time to further his prospects. I have been neither ignorant of his professional shortcomings nor inappreciative of his good qualities. Of such appreciation Professor Ross has himself adduced several expressions from my letters.

In the hope that you may find in the above a substantial answer to the questions involved in your inquiries, I remain,

Very truly yours,

DAVID S. JORDAN.

THE SECOND MEETING OF NATURALISTS AT CHICAGO.

THE committee appointed by the meeting of 1899 issued a call for a second meeting of Naturalists at Chicago, December 27th and 28th. About one hundred naturalists were in attendance or three times the number present last year. Among those present in addition to the Chicago Naturalists were Messrs. Folsom, Hart, Holferty, Mills and Frank Smith of University of Illinois; Professors Loey and Charles Hill of Northwestern University; Needham of Lake Forest; Atherton, Birge, Juday, and Timberlake of Wisconsin; Densmore, and Grant Smith of Beloit; Lee, MacMillan and Nachtrieb of Minnesota; Osborn of Hamline; Nutting and Shimek of Iowa; Kelly of Cornell College; Thorn of Missouri; Ward of

Nebraska; Dr. Ida Hyde of Kansas; Rameley of Colorado; Eigenmann, King, Mottier and Slonaker of Indiana; Tower of Antioch College; Williams of Miami University; Grover of Oberlin; Guyer of Cincinnati; Williamson of Vanderbilt; Copeland and Parke of West Virginia; Holmes, Jennings and Pearl of Ann Arbor; Clark of Olivet; Bensley and Jeffrey of Toronto. The attendance was drawn from a much larger territory than last year and included proportionately far more botanists. Professor Nutting presided at Thursday's session and Professor Birge at Friday's.

All day Thursday papers were read at a general session and in the evening a dinner attended by forty-one persons was held at the Quadrangle Club. Friday morning was devoted to a discussion on 'State Natural History Surveys; methods, results and co-operation.' Professors Birge, Nachtrieb and Frank Smith opened the discussion in which Professors Eigenmann, MacMillan, Nutting, Ward, Cowles, Hartzell and others also took part. The papers of Professors Birge, Nachtrieb and Smith will appear in SCIENCE. As a result of an eloquent plea for higher ideals of university and college administrators with reference to research, made by Professor Loeb at the dinner, the following committee on the relations of colleges to research was appointed: Professors Loeb, Cowles, H. M. Kelly, MacMillan, Nachtrieb, Nutting and Ward. As the relation of the Naturalists' meeting at Chicago to the American Society of Naturalists was still undefined no definite organization was effected but the following committee on a meeting in 1901 was appointed: Professor S. A. Forbes, University of Illinois, Chairman; W. A. Locy, Northwestern University; Conway MacMillan, University of Minnesota; D. M. Mottier, University of Indiana and C. B. Davenport, University of Chicago; the last as Secretary.

On Friday afternoon separate sections in botany and zoology were organized for the reading of papers. Abstracts of the papers read at the meeting follow:

On the Absorption of Water by Frogs: HENRY H. DONALDSON.

A group of frogs that had been dried for hours was weighed and it was shown that through exposure to the air of the laboratory in a dry dish, they had lost 14 per cent. of their body weight. These frogs were at once placed in a dish containing water about 1 cm. deep, and in 24 hours had regained nearly the entire weight lost by drying. This gain in weight was attributed to the absorption of water through the skin, and the fact that frogs never took water by the mouth was emphasized. Both the loss and the absorption of water are more rapid during the summer season than in the period of hibernation. The general influence of this capacity of the frog to lose and gain water readily was pointed out, and the evidence adduced that the amount of water normal to the spinal cord varied with the season of the year, being high from the last of May to the first of July, a season during which growth probably occurred, and gradually diminishing from this period to the time of hibernation.

Heterogeneous Induction in Tadpoles: E. B. COPELAND.

In water deficient in oxygen tadpoles swim like fish, with their noses to the surface. This behavior, though, is not a direct search for oxygen, but a manifestation of negative geotaxis. If the water is covered with oil they stick their noses into it and keep them there, or in full and closed glass vessels they keep their noses against the glass above. When in the greatest need of oxygen they remain, as under ordinary conditions, negatively phototactic. Their behavior with reference to gravity is not the result of their own experience.

The Reactions of Hydra to the Electric Current: RAYMOND PEARL.

An expanded hydra with the long axis of the body at right angles to the direction of the current becomes oriented with the head towards the anode shortly after the current is made. This orientation is brought about by a contraction at a point just above the foot on the anode side of the body. The bending of the body at this point is very slow, but continues until the long axis is parallel to the direction of the current and the head is towards the anode, *i. e.*, until the Hydra is oriented. The details in the mechanism of this orientation are modified with increasing intensity of current, but the essential factor, namely, contraction on the anode side, is constant except when the very strongest currents are used. On making a current of such strength as practically to kill the hydra, immediately there occurs a slight muscular spasm on the *kathode* side of the body. If at the time of making the long axis of the body is already parallel to the direction of the current and the head is towards the anode, the animal contracts immediately and violently, while in the opposite position there is no immediate contraction. The contraction phenomena of the tentacles are different from those of the body as a whole.

The Effect of some Climatic Factors upon the Color and Color-patterns of Insects: W. L. TOWER.

The effect upon variations of color and color patterns of the environmental factors, temperature, moisture, food and light has been investigated experimentally during the past two years. Coleoptera and Lepidoptera have been used and have been subjected to the conditions of the experiments throughout the life cycle. The results represent more nearly the effects these factors produce as they act in nature, than when applied at one stage alone, *i. e.*, pupal.

The most extensive work has been done with *Leptinotarra decem-lineata* Say, and these results will be published soon.

Additional Remarks on Cave Salamanders: C. H. EIGENMANN.

The types of a new cave salamander from Missouri were exhibited, also a specimen of the bleached cave salamander, *Typhlotriton* from Marble Cave, Mo. The latter had been kept in the light for a few weeks and showed a marked increase of pigment in its chromatophores. The amount of bleaching in cave animals is directly proportional to the degree of degeneration reached by the eye. Whether there is any connection between the two is under investigation. Epigean species, if living in caves for any length of time, become bleached. The presence or absence of color is, then, due in the first instance to the environment. The cave fishes of Indiana no longer respond to the change in their environment, as the salamander does, and even the young of the cave fishes, if reared in the light, do not take on color. The bleached condition has become hereditary in their character. In the establishment of the bleached condition, which in the first case is an individually acquired character in the hereditary mechanism, we have an instance of the transmission of the direct effect of environment.

The Relation between Base-leveling and Plant Distribution: HENRY C. COWLES.

The local distribution of plants depends largely upon the character of the topography. The topography constantly undergoes well-known changes, hence the vegetation must change. In other words the ecological study of plants and plant societies should be based on dynamical principles. The growth of a river well illustrates these principles; first, there is a xerophytic gully, then a ravine, whose slopes soon become mesophytic. As the valley widens the

slopes become xerophytic. In the valley itself a flood plain eventually develops which has at first a hydrophytic and finally a mesophytic flora. There are local digressions from this history, but in general it may be said that mesophytic flood plain vegetation is ever on the increase and may be regarded as the ultimate type.

Base-leveling and its Faunal Significance, with Illustrations from Southeastern United States:
CHARLES C. ADAMS.

Attention was called to the necessity of correlating the influences of the base-leveling processes with the distribution of habitats, and especially the importance of a knowledge of river histories in the study of fresh-water faunas. An outline was given to illustrate the principles involved in the reduction of an elevated country to sea-level. By the growth of valleys there is a decrease of uplands, a premium being placed upon those forms whose habitat is increasing in area; thus tension lines are produced. There is a definite succession of forms advancing up a valley, and thus in descending a river one may find a rough recapitulation of the types of faunas which occupy a stream during its ideal history. With a reduction of divides, rapid water, upland faunas are the first to mix. Attention was attracted to the importance of the base-leveling factors about two years ago, in connection with the studies on the *Pleuroceridæ*. The anomalous distribution of this family in the Tennessee and Coosa-Alabama river systems was at once explained upon learning, at that time, that formerly the Tennessee river from Chattanooga flowed to the Gulf via the Coosa-Alabama system. Valley faunas are isolated by uplands and *vice versa*. The Cumberland Plateau and the Smoky Mountains have been isolated by the Tennessee valley and consequently have peculiarities in their fauna. The land shells, according to Pils-

bry, of the Cumberland Plateau have about 20 characteristic species or varieties and the Smoky Mountains about 25. The geologists (Woodworth) have had a better appreciation of these factors. Students of distribution should give more importance to habitat as a dynamical factor in their study of faunal problems. This will lead to the study of faunas in a comparative and genetic way.

Demonstration of certain Features in the Reactions of Infusoria: H. S. JENNINGS.

Demonstrations by means of the projecting microscope and stereopticon, of the reactions of unicellular organisms toward carbon dioxide and various other chemicals. The demonstrations were essentially the same as those described in SCIENCE for January 11, 1901, pp. 74, 75.

On certain Methods by which Organisms Regulate their Movements with Relation to the Position of External Objects acting as Stimuli: H. S. JENNINGS and RAYMOND PEARL.

The paper showed the biological significance of the revolution on the long axis, with the resulting spiral path, which is a feature of the swimming of many lower organisms. These organisms usually tend to swerve toward one side, and thus to swim in circles; the revolution on the long axis converts this circular path into a spiral one, and thus permits an unsymmetrical organism to follow a course which is in effect a straight one. The paper gave an account of very simple mechanisms for turning to or from a source of stimulus in a number of organisms, Rotifera, ctenophores, flatworms, and the earthworm.

Experiments in Artificial Parthenogenesis: J. LOEB. Already described in SCIENCE.

Cænogametes: DR. B. M. DAVIS.

The peculiar multinucleate gametes of the *Phycomycetes* were considered and the results of Dr. Stevens' studies and the writer's on *Albugo* were described. These

peculiar structures (Cœnogametes) are likely to be found far more generally in this group of fungi than has been imagined, and the subject takes on considerable biological interest.

The fusion of multinucleate gametes results in the pairing of the sexual nuclei and consequent union, two by two, giving about half as many fusion products as the original number of sexual nuclei. The phenomenon recalls the conjugation of swarm spores in water outside of the parent gametangium, the difference being that here the sexual elements are retained in the parent structure.

The origin of these cœnogametes is uncertain. It was suggested that they may have come from a much simpler condition of sexual organs than has been supposed. They are possibly derived from a gametangium of the lowly type presented in several algal groups where motile gametes are discharged into water. An alternative hypothesis demands that the behavior is exceptional and derived from a condition of heterogamy. But a serious objection will be raised to such a view if the cœnogametes, as seems likely, are found to be far from exceptional among the *Phycomycetes*.

Early Development in certain Hybrid Species.
W. J. MOENKHAUS.

In more than 20 crosses among fishes, there was not a single failure of impregnation, although some of them were between species of different orders. The per cent. of impregnation ranged from 1 to 95. The highest per cent. may be between the most distantly related species. Eggs normally impregnated complete the segmentation stages. Two crosses and their reciprocals largely went to closure of the blastopore with the main axis of the embryo apparently normally formed. Only the closely related species went far enough to hatch. The cross between brook trout ♀ and lake trout re-

sulted in 'fingerlings,' a large per cent. of which had the caudal peduncle aborted and many had the anal fin wanting.

The rate of development was in all cases that of the egg species or slower. The conjugation of the pronuclei is normal. In the first cleavage spindle of the cross between *Fundulus heteroclitus* ♀ and *Menidia notata* the ♀ chromosomes appear as long, slightly wavy rods, and the ♂ chromosomes as short, comma-shaped rods. This difference is maintained to the 16-celled stage, as far as they have been followed. In the cross between *Fundulus heteroclitus* ♀ and *Ctenolabrus adspersus* the ♂ chromosomes are scattered along the spindles. This condition obtains as far as the third cleavage and there is some evidence that some or all of the ♂ chromatin may be lost in the course of development.

Abnormalities on the Horny Plates of the Turtle, Chrysemys marginata: S. E. MEEK. (Will appear in the *American Naturalist*.)

Variation in the Madreporic Body and Stone Canal of Asterias vulgaris: GERTRUDE C. DAVENPORT.

A number of cases of multiple madreporic plates were observed in the starfish *Asterias vulgaris*, of Cold Spring Harbor. This multiplicity may occur either in one interradius, in several of them, or in all. Thus three plates were observed in one and the same interradius and in another case five. In one case five plates were observed in one interradius, and one in another of the same starfish. A six-rayed individual had one madreporic plate in each of the six interradii. When only one madreporic plate is present it may be lobed or partially divided by cross seams into 2, 3, 4, 5 and 6 parts.

The multiplicity of plates may or may not be accompanied by a multiplicity of stone canals. A group of four plates had only one canal, while one of five had two.

In European starfishes multiple madreporic plates occur in those forms that multiply by self division. Hence they are the result of regeneration. This multiplicity is more frequent in starfishes, normally or abnormally, with more than five rays. The Cold Spring Harbor starfishes very freely cast off their arms when handled. Do they practice autotomy in nature?

*Some Variations in *Lucanus placidus*, Statistically Examined:* ELIZABETH B. MEEK.

The mandibles of the stag beetles, especially in the male sex, are extraordinarily developed and armed with teeth or projections. These vary greatly in different species and in different individuals of the same species; correlative with these differences there are extreme differences in body length. In some species the variations are so great that dimorphism exists, resulting in a division into high and low males. A quantitative expression for these differences in size and form in *Lucanus placidus*, was sought, with the following results: The average body length is .4 mm. greater in the male than in the female and the coefficient of variation is greater; this is also true of the mandibles where the average length is 2 mm. greater in male than female. The coefficient of correlation between length of body and length of mandible is .2 greater in the male than female. The teeth on the mandibles may be termed primary and secondary. A large or primary tooth is invariably present on the mandibles of both male and female, but there is great variation in position, form and number of the secondary teeth even on the same pair of mandibles, as one cutting edge may have only one while the opposite has any number of secondary teeth. Average number of teeth on mandible of male is 4 more than on female. There is a correlation between the number of teeth and length of mandible which is .2 mm. higher

in males than females. Number of spines on fore tibiae varies from 6 to 11, with an average of 4 more upon tibiae of males than females.

It is thus found, as should be expected that variation is greater in the males than females. Also that there is no dimorphism in length of bodies, mandibles nor tibiae. There is positive skewness in the body lengths and negative in the mandibles, but just what this may mean I am, at present, unprepared to say, as this study is preliminary to a more complete one of the variation and distribution of representative Lucanidae in the United States.

*The Place-mode of *Daphnia pulex*, for Cold Spring Harbor, Long Island:* H. M. KELLY.

The results of measurements of many organs on a large number of individuals.

Contributions to the Biological Interpretation of Skew Variation: C. B. DAVENPORT.

The paper presented conclusions based on a study of many cases of skew variation in organisms.

The Genetic Development of the Forests of Northern Michigan: H. N. WHITFORD.

This article will appear in full in an early issue of the *Botanical Gazette*. The factors controlling the distribution of plant societies and formations are divided into three groups—climatical, ecological and historical. These are discussed with special reference to their effects on forests.

A succession of plant societies on four sets of physiographic formations is recognized. In each instance the climax society is the deciduous forest.

In the sand series the stages are beach, heath, coniferous forest and deciduous forest. Here a controlling factor is the accumulation of humus. The pre-Cambrian rocks of the Marquette region offer an admirable field for the stages in the life-history of rock societies. Here not only humus, but inorganic soil, has to be accu-

culated before the deciduous forest appears. Swamp series and clay soil series show similar stages before the climax deciduous forest society is made possible. In every instance there must be a coniferous or poplar-birch forest before the maple-beech deciduous forest, for in that way only can shade conditions be obtained for the protection of maple and beech seedlings.

Application of the Quantitative Method to the Dynamical Study of Plant Societies: HENRY C. COWLES.

The vegetation in the vicinity of Chicago is being systematically mapped from an ecological standpoint, topographic maps being used as a basis for work. By means of accurate mapping and recording of field observations at selected points, it is hoped that sets of data may be obtained showing the rapidity of encroachment of one plant society upon another. By means of photographs taken at one-year intervals considerable change has been found in the dune region, and this suggests the desirability of a similar study for other plant societies.

An Anatomical Classification of Vascular Plants: E. C. JEFFREY.

The use of the skeleton in the phylogenetic study of plants has been almost entirely neglected. In recent years paleobotanists have done something to remedy this defect, but they have been without the important aid furnished by the study of development. The present article, illustrated by a large number of photographs of the vascular skeleton of living and fossil plants, and especially the developing skeleton of extant groups of plants, is intended to show that there are a number of absolutely constant and characteristic anatomical criteria.

Stomata of some Liliaceæ: E. P. COPELAND.

The stomata of Liliaceæ are very diverse in structure, but most of them are well built to open and shut. Many of them (*Uvularia*,

Smilacina, *Polygonatum*, *Dracænam*, *Smilax*, et al.) are so circular in surface view that an increase in turgescence would not open the pore if the walls at the ends of the guard cells were not much more rigid than those of their backs. This rigidity is secured by special local thickening, or by the mode of insertion of the walls of adjacent cells. The stomata of *Medeola* are also circular, but the backs are strengthened by folds in the wall. The pore opens by an increase in the depth of the guard cells, i. e., at right angles to the surface of the leaf. It is a perfect development of what has been called the Mucinus type of stoma.

Methods of Plankton Measurement: JACOB REIGHARD and HENRY B. WARD.

The paper presented a brief review of methods introduced by Hensen, and used by a number of observers for computing the amount of plankton obtained by hauls of a vertical net, and of the calculations on theoretical and experimental bases given by Hensen, Reighard and others for determining the coefficient of the net, i. e., the fraction of the column of water which actually passes through it. The authors propose to determine the coefficient by actually measuring the amount of water passing the mouth of the net. This is to be accomplished by means of a three-vane meter suspended in the axis of the net opening a short distance inside its upper rim. By means of an electric pen register the revolutions of meter are recorded on a tape, and parallel to them, both the starting and stopping signals, and the time record from the chronometer, from which it is possible to calculate the number of revolutions in the time of the haul, or the time or revolutions in any desired fraction of the haul. The difficulties and errors in the management of the apparatus were discussed, together with the means for detecting them. The rating of the meter by two different methods was

also considered, and the coefficient of the net shown in the plottings of the rating experiments. Experiments without a meter were also used to demonstrate that the efficiency of Hensen's net had not been diminished, but rather increased by the addition of the brass cylinder and meter at the net opening.

As prominent factors in determining the efficiency of the net were mentioned the size of the orifice, and the ratio between the area of the orifice and the area of the filtering surface. Various details in improvements of apparatus were mentioned, and the laboratory of the United States Fish Commission at Put-in-Bay, together with the steamer and apparatus used and the records obtained, were illustrated from lantern slides.

A New Method of Reproduction in Tubularian Hydroids: C. C. NUTTING.

The medusæ of *Hybocodon prolifer* were found to be reproducing by means of actinules formed on the manubrium. The process of development of the actinules was described, and the intergradation between this process and the production of actinules in the gonophores of ordinary tubularians was traced through a series of forms including *Tubularia spectabilis* (Agassiz), *Tubularia cathouyi* Ag., and *Corymorpha pendula* Ag. The paper was illustrated by charts prepared by the author.

Remarks on the Distribution of Hydroida on the North Pacific Coast: C. C. NUTTING.

The basis of this paper was a study of the Hydroida of the Harriman Alaska Expedition. The division of the Pacific Coast fauna made by Dall in 1876 was found to be untenable in the light of our present distribution of the hydroids. It was shown that there was no marked differentiation between his Aleutian and Oregonian faunæ, on the one hand, and that the Oregonian fauna does not extend to Monterey, California,

on the other. The facts seem to indicate a division between an Alaskan and a Californian province just south of Puget Sound. The author pointed out that this arrangement was only tentative, and that the distribution of other groups of marine animals of that region would be necessary before any conclusive statement could be made.

The Holothurians of the Pacific Coast of North America: H. L. CLARK.

The examination of 52 specimens, representing 11 species, from Pacific Grove, California, has thrown considerable light on the holothurians of the Pacific Coast. The occurrence of three species (*Synapta inhærens*, *Cucumaria calcigera*, *Psolus squamatus*) which also occur on the Atlantic Coast would seem to indicate that these species either are now, or have been, circumpolar forms with southward prolongations of their range on the east and west sides of the continent. The most interesting feature of the collection is the occurrence of three new species, all of which show some peculiarity in the manner of caring for the young. A small, black *Cucumaria* broods its eggs and young, while a small, red *Thyone* is viviparous, the young being found in the body cavity of the mother, as in *Synapta vivipara*. The most remarkable species, however, is the representative of a new genus, *Thyonepsolus*, which is perfectly intermediate in character between *Thyone* and *Psolus*, having the ventral surface flattened to a creeping sole covered by a thin skin, while the dorsal surface is convex and soft. On the sole the feet are in three longitudinal rows, while dorsally they are numerous and irregularly scattered. The young are carried on the back of the mother, partially imbedded in the thick, soft skin.

Structure of Clinostomum (Preliminary notice): HENRY L. OSBORN.

The finding of *Clinostomum* at Neebish, Chippewa Co., Michigan, in August, 1900,

encysted in the black bass and yellow perch, and adult in the mouth and throat of the great blue heron, gave me an opportunity to examine this form. It appears to be specifically identical with the one described by MacCallum in the *Journal of Morphology* (vol. xv, p. 697, 1899), as *C. heterostomum*, and by Braun (*Zool. Jhrb. abt. f. System*, 14, p. 1, 1900), as *C. marginatum*. There are, however, a number of points in which my material differs from the account given by MacCallum. The cuticle is armed with spines, they are very numerous, acutely tapering, run obliquely backward and are located wholly within the cuticle, barely projecting beyond its outer boundary in a few places. There is a single genital opening leading into a common chamber into which the uterus opens from in front and the cirrus sack from behind. A pharynx as described by MacCallum is wanting. The oral sucker, as surmised by Braun, is directly followed by a characteristic œsophagus, lined with cuticle and supplied with usual longitudinal and circular muscle fibers—and surrounded by glandular cells, apparently forming the customary œsophageal gland. Circular muscle fibers are demonstrated in the intestines as well as longitudinal ones in iron hæmatoxylin stained sections. The oviduct opens into the uterus near its anterior end and not posteriorly as indicated by MacCallum. Glandular cells abound in the area directly in front of the ventral sucker, but ducts from them to the oral disk, as described by Braun, have not as yet been recognized in my material.

Note on the Marginal Sense Organs of Cotylodogaster occidentalis: W. S. NICKERSON.
(Paper accompanied by demonstrations.)

Members of the Trematode family Aspidobothridæ, with but one known exception (*Stichocotyle*), have a series of organs in the margin of the large multilocular sucker

which have been generally regarded as sensory structures. These organs in *C. occidentalis* appear to be both sensory and glandular in function. Each is made up of a bulb-shaped body measuring about $38 \times 27 \mu$, which communicates with the exterior by means of a narrow tortuous duct whose outer portion is lined by cuticle continuous with that covering the body. The duct arises from the distal end of the bulb, making first a sharp bend downward beside the bulb for about one-half the length of the latter, then making a second sharp turn toward the surface, where it opens directly over the bulb. The appearance of the contents of the bulb varies from finely granular to coarsely vesicular, corresponding probably with different phases of activity of the glandular protoplasm. Nuclei (except those of nerve cells) are not distinguishable in the bulb. The duct is capable of eversion so that the interior of the bulb may be protruded through the opening. A bundle of delicate nerve fibers enters the bulb at its basal end. The chief interest in the organ centers, however, in a cluster of bipolar cells lying upon the side of the bulb toward which the duct turns. These are undoubtedly sensory cells, and their peripheral processes are probably distributed upon the walls of the duct, although the exact place and method of their termination could not be made out in the specimens studied. The presence of the bipolar sensory cells establishes the sensory character of the organs which hitherto has been a matter of conjecture.

The Changes in the Facial Cartilaginous Skeleton of the Flatfishes, Pseudopleuronectes Americanus (a dextral fish) and Bothus maculatus (sinistral): S. R. WILLIAMS.

In specimens of *P. americanus* about $3\frac{1}{2}$ mm. long whose eyes are still perfectly normal [in position the two supra-orbital

bars are present as in other fishes, extending from the ec-ethmoid cartilages to the otic capsules. The first indication of the coming transformation is the thinning out and disappearance of the left supra-orbital in its middle region just above the eye. Sections give evidence of the pressure exerted, since the eyeball is indented where it touches the supra-orbital. For a short time there are two regions of degeneration, one progressing toward the ec-ethmoid and the other toward the otic capsule. By the time the supra-orbital bar is resorbed the fish is at least 5 mm. long. The left eye begins to pass around to the right side of the animal through the gap prepared for it. This part of the process is comparatively rapid. After the eye shows evidence of elevation it may take the fish three or four days to assume the adult position. Nishikawa, a Japanese observer, described the passage of the eye in 24 hours in one case. Fishes of 15 mm. in length are all transformed and many take the adult position at the length of 9 mm. The twisting from left to right is greatest in the plane of the eyes, being about 120° . The brain case shows little asymmetry. The left nasal pit is raised about 30° and the anterior part of the ethmoid not much more. The mass of the ethmoid is twisted so that the left ec-ethmoid points directly 'up and the right down— 90° from their first position. The dorsal fin, after the passage of the eye, extends forward as far as the middle of the eye.

Bothus, the sand dab, lies on its right side, whereas *P. americanus* lies on its left. But by merely transposing the terms, using *right* supra-orbital instead of *left*, the description just given for *P. americanus* will hold in general for *Bothus*. The dorsal fin extends to the nose ultimately in this species. The sand dab is more symmetrical than is *P. americanus*. This is correlated with its greater free-swimming habit. The

flounder and the sole cling most closely to the bottom and are the most distorted.

The Cardiac Gland of the Mammalian Stomach with Remarks on the Evolution of the Stomach of the Artiodactyla: R. R. BENSLEY.
(Read by title.)

CHAS. B. DAVENPORT,
Secretary.

ANNUAL MEETING OF THE NEW YORK
ACADEMY OF SCIENCES.

THE Annual Meeting of the New York Academy of Sciences was held at 12 West 31st Street on Monday, February 25th, under the presidency of Professor Robert S. Woodward, of Columbia University. The meeting opened with the annual reports of the officers for the year just closed. The Corresponding Secretary reported that the Academy had on its list 41 Honorary Members and 206 Corresponding Members, and that five members had been lost by death during the past year. The report of the Recording Secretary was as follows:

During the last Academy year the business of the Academy has progressed in the customary paths. The several sections have held their usual meetings, with ordinarily the same attendance as in former years. The Council has held the meetings prescribed by the by-laws, and has accomplished several important objects. On the whole, however, the year can not be called a year of progress. The accomplishments of the year leading to increased efficiency in the Academy work are first, the establishment of a series of publication rules that will make the future work of the Editor, and the cost of publication much less than formerly; secondly, the vote to establish a budget for the next fiscal year, within the limits of which each officer will be required to work; thirdly, the hiring of the rooms of the Chemists' Club for the meetings of the next year, at a greatly reduced rental, with accommodations equal to those which

we now enjoy; and finally, a vote to send the *Annals* and *Memoirs* only to those members of the Academy signifying their desire to receive them. The publications of the Academy have been unfortunately delayed during the last year, owing to no fault of the Editor, but the current volume will be very shortly completed and issued. Owing to the expense of the current volume the amount of publication possible by the Academy during the next year will be seriously reduced, unless a publication fund can be established.

The report of the Treasurer showed the following receipts and expenditures for the year:

RECEIPTS.			
Balance as per last report.			\$2,239.11
Mortgage paid off, <i>a/c</i> Permanent Fund.	\$1,202.75		
Mortgage paid off, <i>a/c</i> Audubon Fund.	1,797.25	3,000.00	
Income, Permanent Fund.	426.38		
Income, Audubon Fund.	99.04		
Income, Publication Fund.	90.00	615.42	
Life Membership Fees.		200.00	
Initiation Fees.		75.00	
Annual Dues, 1897.	\$ 10.00		
1898.	30.00		
1899.	170.00		
1900.	2,395.00		
1901.	50.00	2,655.00	
			\$8,784.53

DISBURSEMENTS.			
Cost of Publications, \$2,499.72..			
Less Sales.	30.06..	\$2,469.66	
Cost of Publication (paid by Audubon Fund)	\$309.72		
Rent of Rooms	510.00		
Seventh Annual Reception.	329.68		
Dues to Scientific Alliance.	32.58		
Lectures	20.00		
Expenses of Recording Secretary.	291.44		
Expenses of Librarian.	363.95		
Expenses of Treasurer.	41.93		
General Expenses.	78.37	4,447.33	
Balance on hand.		\$4,337.20	

The Librarian then presented the following report:

The work of the library during the past year has been mainly directed toward keep-

ing the accessions catalogued and in order. This, it is believed, has been successfully carried out. The current numbers of the more prominent periodicals are placed upon accessible shelves and upon the completion of any volume, are arranged permanently with their respective sets. In this connection it is desirable to call attention to the crying need of binding many of the accessions of late years. Hundreds of volumes are stored in their pamphlet form and much injury and loss is the result. During the last year the Librarian was able to have some sixty volumes bound, but financial stringency has prevented any considerable work in this direction.

By arrangement with the authorities of the New York Botanical Garden, the bulk of the botanical portion of the library, which since the removal to Schermerhorn hall at Columbia University, had been stored in boxes, has now been deposited in the Library of the Garden at Bronx Park, and is thus more available than heretofore to general reference.

The Librarian takes pleasure in reporting a gift to the Academy from Professor D. S. Martin of about a hundred volumes of miscellaneous scientific interest.

The statistics of the Library are at this date approximately as follows:

Volumes (bound and unbound) at Columbia University	9,000
Pamphlets, at Columbia University.	2,000
Volumes and pamphlets, at Botanical Garden.	350

Thanks to the activity of Messrs. Van Ingen and White, assisted by Mr. Graham, the files of the Academy's publications have been brought from a state of chaos to one of order, the exchange list has been revised, and the business of correspondence and exchanges is now carried on with promptness and regularity.

The Librarian takes this opportunity to call the attention of the Academy to the

absolute necessity of considering the disposition of the library in the immediate future. We have practically reached the limit of accommodations in the library room, and the department of exchanges is housed in the Gallery of the Museum of Fossil Plants and Vertebrates, in Schermerhorn Hall of Columbia University, solely by courtesy of the Department of Geology, and it has already exceeded the space which that department can conveniently spare. Radical measures must be adopted in the near future or the library must close its doors.

Following the reports of officers was the election of the honorary members listed below :

Charles Vernon Boys, 66 Victoria St., S. W., London, England.

Emil Fischer, Professor of Chemistry, University of Berlin, Germany.

William Ramsay, Professor of Chemistry, University College, London, England.

James Geikie, Professor of Geology, University of Edinburgh, Scotland.

The Academy also voted to elect the following resident members to be fellows :

Dr. Henry E. Crampton, Dr. J. G. Curtis, Dr. C. A. Herter, Professor Graham Lusk, Professor Charles Lane Poor, Mr. C. A. Post, Dr. E. L. Thorndike, Dr. R. S. Woodworth. "Fellows are limited to one hundred in number, and are chosen from among the resident members in virtue of scientific attainments or services."

Tellers were then appointed, and the officers for the ensuing year were elected by ballot as follows :

President, Robert S. Woodward.

1st Vice-President, Nathaniel L. Britton.

2d Vice-President, J. McKeen Cattell.

Corresponding Secretary, Harold Jacoby.

Recording Secretary, Richard E. Dodge.

Treasurer, Charles F. Cox.

Librarian, Livingston Farrand.

Councilors, Franz Boas, Charles H. Judd, Charles A. Doremus, M. I. Pupin, Frederic S. Lee, L. M. Underwood.

Curators, Harrison G. Dyar, George F. Kunz, Alexis A. Julien, Louis H. Laudy, E. G. Love.

Finance Committee, John H. Hinton, C. A. Post, Cornelius Van Brunt.

Following this routine business President Woodward delivered his annual address, entitled 'Observation and Experiment,' which will shortly be printed in this JOURNAL. After a vote of thanks to the President for his address, proposed by ex-President Henry F. Osborn, the meeting adjourned.

RICHARD E. DODGE,
Recording Secretary.

RECENT PROGRESS IN GEODESY.*

So much has been published during the past year in regard to recent events in the world of geodesy that there is apparently little to be said upon this occasion. But a bird's-eye or general view of a subject has its own special interest and value even to those who are familiar with the details.

It is not necessary to review the recent progress in geodesy in foreign countries, since such a review was presented in January before the Society in the form of a report upon the International Geodetic Association Conference of 1900, by Mr. Isaac Winston, the delegate on the part of the United States to that conference, and this report is in print.†

The principal geodetic enterprise now on foot in the United States is the measurement of a great arc along the 98th meridian from the Rio Grande to the Canadian border. Work upon this arc was commenced in 1896. The present state of the undertaking is that the reconnaissance is complete from northern Nebraska to the Rio Grande; that the triangulation, that is, the measurement of the horizontal and vertical angles, is complete from latitude $42\frac{1}{2}^{\circ}$ in northern

* Read before the Philosophical Society of Washington, February 16, 1901.

† See SCIENCE, January 25, 1901, pp. 129-133. A more complete report upon the conference is published in *Revue générale des sciences*, Nov. 15, 1900, pp. 1175-1183; Nov. 30, 1900, pp. 1224-1233.

Nebraska to latitude $38\frac{1}{2}^{\circ}$ in southern Kansas, a distance of about 300 miles along the meridian. Nine bases have been measured along this arc in addition to the Salina Base on the 39th parallel arc, which serves also to control the lengths on a portion of the 98th meridian arc. But four more bases are necessary for this arc, one at the Rio Grande and three in the Dakotas.

During the year 1900 two triangulation parties were in operation, one working northward in Nebraska and the other southward in Kansas. A base party of ten officers and men, which arrived on the working ground on July 16, 1900, in Nebraska, had by January 23, 1901, standardized the base apparatus twice, at the beginning and end of the season, and had measured the nine primary bases referred to above. The probable error of each base is less than one part in a million. If this feat of measuring nine bases as well as standardizing the apparatus in but little more than six months, while holding the accuracy up to the best standards of the past, is considered with reference to the moderate size of the party and the time which has been required for former primary base measurements, it will be seen that there has been no lack of progressiveness along this line.

One of the events of the year has been the connection of the gravity measures in the United States with those in Europe by swinging a set of the half-second pendulums, which serve to determine the relative values of gravity, at the base station at Washington and at the European stations at London, Paris and Potsdam, at which the more important European absolute measures have been made. The result of this expedition is to import, at a very small cost in time and money, the expensive and laborious determinations of the absolute value of gravity which have been made in Europe.

During the last two years the instrument and the methods used in precise leveling of the Coast and Geodetic Survey have been radically changed with a view to increasing both the accuracy and the rapidity of the work.* The evidence as to the accuracy of the new work is rapidly accumulating and so far fully justifies the changes made. The lines of leveling are being rapidly extended, a total of 1750 miles having been run during the last two years.

The most marked progress, however, in the matter of leveling has been the adjustment of the level net covering the eastern half of the United States. More than 13,000 miles of precise leveling had been run by various organizations in the United States. But until within a year the results had not been correlated. To obtain the results it was necessary to search through scores of volumes, and even when this had been done it was found that the results had been published as if each line or group of lines was entirely independent of the others, whereas in fact the connections existed for treating the whole as a single net upon one basis. The adjustment of this net has now been made. The elevations and descriptions of the four thousand permanent bench marks connected with the net, and the principal items of information in regard to each of the lines, have been published in a single volume.†

During the year the report upon the transcontinental triangulation, which marks an epoch in the history of geodesy in the United States, has been published.‡ The computation of the eastern oblique arc, extending from Maine to Louisiana has been

* See Proceedings of the American Society of Civil Engineers, November, 1900, pp. 1113-1161.

† See Appendix 8 of the Coast and Geodetic Survey Report for 1898-99, pp. 347-886.

‡ The Transcontinental Triangulation, Special Publication No 4, of the Coast and Geodetic Survey, Washington, 1900, 4to, 871 pages.

also completed* and the report will soon be ready for the printer. The relations between the measures of the earth made in the United States and the previously accepted values for the earth's size are shown in the table given below.

The last two determinations shown in the table are of light weight in comparison with the preceding three.

A study of these values will show that the modern observations in the United States indicate that the true value of the equatorial radius lies between the Clarke and Bessel values, but nearer the Clarke value, and for the polar semi-axis is a little greater than the Clarke value.

axis so computed will differ from the Clarke values of 1866 by as much as 500 meters, and it is about an even chance that either value will not differ from the corresponding Clarke value by more than 170 meters, this being about the height of the Washington monument. In other words, there is little likelihood that the Clarke spheroid of 1866 now used as the standard in this country differs from the spheroid which will most nearly fit this country alone by more than one part in 12,000, and there is an even chance that it does not differ from it by more than one part in 36,000.

It is reasonably safe to make the same prediction in regard to the earth spheroid,

	Equatorial radius, a , in meters.	Polar semi- axis b , in meters.	Compression ($a-b$)/ a .
Bessel spheroid of 1841.....	6,377,397	6,356,079	1/299.2
Clarke spheroid of 1866	6,378,206	6,356,584	1/295.0
Harkness, 1891. From 'The Solar Parallax and Related Constants,' Washington, 1891, p. 138. From a variety of sources...	6,377,972	6,356,727	1/300.2
The spheroid determined by the 39th parallel triangulation and the Lake Survey arc of the meridian.....	6,377,912	6,356,309	1/295.2
The spheroid determined by the 39th parallel triangulation and Peruvian arc	6,378,027	6,356,819	1/300.7
Eastern oblique arc of the United States	6,378,157	6,357,210	1/304.5
Nantucket and Pamlico-Chesapeake arcs of meridian and Peruvian arc of meridian.....	6,378,054	6,357,175	1/305.5
Lake Erie arc of parallel and Peruvian arc of meridian	6,379,822	6,357,716	1/288.6

Having in mind the large number of astronomical stations attached to, and the large area covered by, the arcs already utilized in the United States, as indicated above, it is reasonably safe to predict that if the United States is eventually completely covered by triangulation and astronomical stations are liberally supplied everywhere, and the mean figure deduced from these observations alone, regardless of those made in other countries, neither the equatorial radius nor the polar semi-

or the spheroid which will most nearly fit all the measures which may hereafter be made in all countries, as has been made above for the spheroid which will most nearly fit the United States.

JOHN FILLMORE HAYFORD.

U. S. COAST AND GEODETIC SURVEY.

THE SAN JOSE SCALE IN JAPAN.

THE insidious invasion of the eastern United States by the San Jose scale (*Aspidiotus perniciosus*)—the name gives undeserved notoriety to the California city—has come to be so formidable that the pest is now recognized as one of the most seriously threatening dangers to American

* See 'Recent Contributions to our Knowledge of the Earth's Shape and Size by the United States Coast and Geodetic Survey.' C. A. Schott, *The National Geographic Magazine*, January, 1901, pp. 39-41.

fruits. In thirty-five or more States and Territories, and in Canada, the insect is recognized as a scourge. The invasion has been met by the active antagonism of economic entomologists, State Legislatures and fruitgrowers. A dozen or more States have passed laws providing for the inspection of nursery stock and fruits brought into the State, and for the destruction of stock found to be infested by the scale. The life history of the insect has been carefully studied, the effects of new climatic and topographic environment noted, and new remedies devised and tested. The attention this tiny degenerate insect has received puts it in that notorious list of insect scourges of the first class which includes the chinch bug, the Hessian fly, the Colorado potato beetle, the codlin moth and other familiar pests.

It is recognized more clearly to-day than ever before, how all important in keeping insect pests in check are their natural enemies, predaceous and parasitic, and of how much less avail in most instances are the artificial defenses and offenses which man has devised. The natural remedies are immensely more effective than the artificial remedies. Indeed so extreme a view of the whole matter of insect-fighting is held by some entomologists that they openly commend a 'laissez-faire' policy in economic entomology except as regards purely localized efforts. My own feeling is that of much sympathy with this reaction against the multiplied, expensive and oftentimes conspicuously ineffective artificial panaceas. On the other hand, where the economic entomologist bases his war strategy on a thorough study of the life history and ecology of the particular insect enemy engaged with, and where he seeks primarily to discover natural aids for his attacks, where he thinks first of encouraging and strengthening the natural defenses of the attacked and of reenforcing the natural barriers to

the spread and increase of the attacking pest, he is, it seems to me, on the way to do the best work for the suffering orchard or grain field.

One of the promising lines of work of this kind is the search for and the importation and propagation of the natural enemies (usually predaceous or parasitic insects) of introduced foreign pests. The too successful naturalization of these foreigners is in most instances due, presumably, to the fact that they come to us unaccompanied by their natural native enemies. Free from the principal check to their increase, they multiply and spread with alarming rapidity (providing the conditions of climate and topography permit), giving us a momentary glimpse of life uncontrolled by the balance wheel of one phase of the struggle for existence. It is quite true that much that is ill-considered and imaginative has been spoken and written regarding the success of the importation of parasites. And the expectations of the uninformed, or rather of the falsely informed, are hardly likely to be met soon. But there is an encouraging residuum of fact left after the froth and bubble have been blown from the California stories. The *Vedalia* has really eaten up about all the cottony cushion scale (*Icerya*); and some other imported lady-birds are really eating up a good many other scales. I believe that it is at least worth while to see if there is any hope of getting some active and competent lady-bird beetle to look after the San Jose scale.

But to search for the native enemies of the San Jose scale it is necessary to know the nativity of the scale itself. And this is something as yet undetermined (unless, it has been determined by the investigation about to be written of). Without canvassing in detail opposing claims for the honor, it is sufficient to say that Japan and California are the two leading claimants in the

matter; each claiming that the other is the native home of the pest. With this generous rivalry in mind, and with the further thought of the desirability of finding an effective natural enemy of the San Jose scale, Mr. Shinkai I. Kuwana, Assistant in Entomology at Stanford University, spent all last summer in Japan collecting and studying in the field the Japanese scale insects (the first attempt at a systematic investigation of the Japanese Coccidæ), paying special attention to the San Jose scale. Mr. Kuwana's collections are large, and his notes many, and interesting. His familiarity with the language, the customs and the geography of Japan gave him special advantages in the work.* He visited all the large islands of the empire, penetrating into the interior among the mountains, as well as examining the coast line orchards. He was greatly aided by Japanese naturalists and fruit growers, and altogether was able to make an extended reconnaissance.

As a result of this exploration it is certain that the San Jose scale is widely and commonly distributed over the whole empire of Japan (excepting on the island Shikoku), though in but few places is it a serious pest. It is found on the following hosts: Pear, apple, plum, peach, Japanese quince, currant, willow (*Salix gracilistyla*), and *Paeonia montana*. It is found especially common in young orchards where its chief injuries are done. It is present in certain of the very old interior orchards, where it has been known, under the name Ki-Abura, for more than thirty years. It is attacked by several enemies, Mr. Kuwana personally finding one chalcid, three lady-bird beetles and one moth, the larva of which feeds on the scale. Of these enemies the chalcid fly and one of the lady-bird beetles are

* Mr. Kuwana's own detailed report of his investigation can not be ready for publication for several months.

everywhere common, and are effective checks to the increase of the scale. It is probable that the comparatively little injury produced by the scale in Japan, widespread as it is, is due to the presence of these natural enemies. The artificial remedies used in Japan against the scale include 'soap water,' solution of caustic soda, and kerosene. The soda solution (one pound caustic soda to 10 gallons of water) is applied with cloths and the trees then washed with pure water. The other insecticides are applied with a Japanese paint brush. After a rain the fruit growers go into the orchards with ropes or cloths and rub off the scales while wet.

Variation among individuals of the scale is apparent but not considerable. The scales are uniformly dark, either black or dark brown. The white secretion covering the exuviae of the males is comparatively scant, in some cases almost wanting. The chitinous processes on the posterior margin of the abdomen of the female vary somewhat, but the relative size and arrangement remain fairly constant. There may be as much difference, indeed, between the processes of the two sides (lateral halves) of this margin as between the processes of two individuals.

Mr. Kuwana's observations point strongly to the Japanese nativity of the scale, or at least to its inhabitancy of Japan prior to its brilliant career in North America. It must be noted, however, that the scale was not found strictly 'wild' in Japan; that is, it was not found on any wild (uncultivated) tree in its natural habitat. The willow trees found infested with scales were in the ground of the Government Forestry Station at Nishigawara. The scale was, indeed, found on mountain (or wild) pear trees, but these trees were in or near an old apple orchard.

VERNON L. KELLOGG.

STANFORD UNIVERSITY, CAL.

SCIENTIFIC BOOKS.

Studies in Fossil Botany. By DUNKINFIELD HENRY SCOTT, Ph.D., etc. London, Adam and Charles Black, The Macmillan Company. 1900. Pp. 533. Illustrated. Price, \$2.75.

The gathering force represented in the paleontological researches of the last quarter of a century is now finding expression in publications which not only summarize the results reached by individual investigators, but which coordinate them and thereby give them a positive value as contributions to our knowledge of the character and succession of plant life in past times. The closing years of the nineteenth century witnessed the issue of three important works by Potonié, Seward and Zeiller. The initial work of the twentieth century by Scott may well take rank with them, and it offers the most hopeful indication of what we may reasonably expect from the paleobotanical work of the future. All these works have the common characteristic that they approach the subject from the standpoint of modern phylogeny, and we may, no doubt, safely conclude that they represent the completion of that 'harmony between the botany of extinct and existing forms' which botanists have always regarded as most essential, but the realization of which has been long deferred. They place the whole subject of paleobotanical research upon an entirely new basis, and this branch of botanical inquiry is now emerging from a condition which may well be compared with the transition from the Old to the New School of Botany in 1860.

In presenting his '*Studies in Fossil Botany*,' Dr. Scott does not wish us to infer that he is attempting to produce a manual or even a textbook; but his contribution is founded upon a course of lectures delivered in 1896, which he has now brought down to date, and the title clearly indicates that he avoids the particular field already occupied by Potonié, Seward and Zeiller, whose works follow parallel though dissimilar lines of treatment. The purpose of the author is expressed in the statement that the work is designed to present results which appear to be of fundamental importance, and he therefore confines his attention to a few of the leading groups of plants within which the

greatest advances of recent years have been made, and where most tangible results have been secured. Other publications give greater detail respecting species, taxonomy and geological relations, but the present work acquires special importance and value because of the close insight into relationship disclosed by a detailed study of comparatively few types on the bases of ample material and remarkably well-preserved specimens. His presentation is a statement of facts rather than an exposition of views. We may not only sympathize with him in the hope that the paleontological record will no longer be ignored by students of the evolution of plants, but also express the conviction that in the future botanists will *not* ignore such evidence, simply because they can not afford to do so.

The material used is primarily that which Williamson gathered during his lifetime, together with such additional material as has come to the hands of Dr. Scott and others in more recent years. The author adopts Solms-Laubach's principle of 'the completion of the natural system' as his point of departure. He therefore discards all problematical forms and confines his attention solely to the relatively few types which contribute well-ascertained data. All discussions center in phylogeny, and the work stands as one of the best expositions of the importance which attaches to the study of fossil plants as a necessary means of completing such data.

After a brief discussion of the relations of plants in geological time and their methods of preservation, the author immediately proceeds to a consideration of the Pteridophyta and the lower Seed Plants, and in a very lucid and convincing manner places before the reader the essential facts in the structure, reproduction and relationships of those plants in which the paleontological progress of the past twenty years has centered. In the main, the illustrations are taken from Williamson's works, and a very striking and pleasing feature appears in a skilfully executed restoration of *Lyginodendron Oldhamianum* which is introduced as a frontispiece.

In the present condition of our knowledge, a classification of the Calamariæ is difficult in

consequence of the fragmentary character of the material. For this purpose the fructification which, as also the stem, had a complexity of structure unknown in modern representatives of the Equisetineæ, affords the most satisfactory basis, and the system proposed by Weiss, in which he makes use of such external characters as scars, is shown to be of no value except for geological purposes. In *Calamostachys Casheana* the axis of the cone shows a secondary growth in the vascular system and thus gives a final negative to the view so strongly advocated by Brongniart, that secondary growth in the wood is a certain characteristic of the phanerogams. The Calamariæ show no transitional forms with the Coniferæ, and can not be regarded as their progenitors. In fact, our knowledge of these plants is at present so inadequate, that we can not regard them as anything more than a highly organized family of the vascular cryptogams closely allied to the Equisetineæ. But the question still arises if they show any affinities with any of the seed plants? If such affinity exists, it would probably appear in the direction of the Coniferæ or possibly of the Gnetales. The anatomy of the stem certainly approaches the former, while the structure and simple form of the leaf are not without significance. It is also true that the relative positions of the sporangiophore and bract in *Paleostachys* have been compared with those of the ovuliferous and carpellary scales of the Abietineæ, but it is altogether probable that these examples are nothing more than interesting parallels in development which have no force in establishing relationships, and these latter must be sought in other directions, especially as there are no transitional forms connecting the two groups.

The Sphenophylleæ represent a group of the greatest phylogenetic interest, inasmuch as they occupy a position of which there is no representative among existing species. The genus *Sphenophyllum* constitutes a perfectly distinct group of which all the parts are well known in one species or another, and there is no longer room for the idea that these plants represent the foliage of a Calamite. Heterospory may have been present, but so far there is no direct evidence in support of such a view.

The remarkable cones known under the name of *Cheirostrobos pettycurensis* have as yet not been found in connection with other parts of the plant, so that it is impossible to determine the exact nature of the organism to which they belonged. So far as known, however, they were homosporous, but the material now available does not admit of final conclusions in this respect. It is nevertheless certain that these cones were of a remarkably complicated type, and while in the character of the sporangiophores, and in the insertion and structure of the sporangia they exactly agree with the Calamarian type, the anatomy of the axis shows them to approach the Lepidodendroid lycopods, whence we may conclude that they represent a synthetic type combining the characters of different groups of plants.

From these facts Dr. Scott draws the inference that the Sphenophyllaleæ were highly modified representatives of an ancient stock from which both the lycopods and the Equiseti have diverged, but our knowledge of these phyla rests at present entirely upon the evidence of fossil plants.

In *Lepidodendron*, the well-defined presence of ligules serves to indicate a connection with *Selaginella* rather than with *Lycopodium*, a view which would seem to gain additional strength from the observed heterospory of *Lepidostrobos Veltheimianus*. Another feature of exceptional interest is the fact that in some of the cones of Paleozoic lycopods, the origin of which has been fully traced, an integument is formed about the macrosporangium in such a way as to produce a seed like body which eventually becomes detached, as exhibited in the well-known *Cardiocarpon anomalum* of Williamson; and this development is repeated in *Lepidostrobos*, where the microsporangia are similarly invested by an integument. In this we obtain the first definite indication of those transitional forms which serve to connect the Cryptogams with the higher seed plants.

The earlier views of Brongniart, which placed the *Sigillarias* among the Gymnosperms, are shown to rest primarily upon the fact that the first described *Lepidodendron* (*L. Harcourtii*) is devoid of secondary wood growth, and emphasis is placed upon the now well-known

fact that the Sigillariæ have not even a remote connection with those plants.

Stigmaria is held to represent a rhizophore, of which the stigmarian appendages would therefore be the roots. From this point of view these remains must be regarded as representing organs comparable with the rhizophores and roots of existing Selaginellas.

Dating from Silurian time, the ferns gained special prominence in the Carboniferous, where it is even yet difficult to separate the true ferns from fern-like plants. The author nevertheless adopts the conclusions of Bower and Campbell respecting the relative antiquity of the Eusporangiatæ and Leptosporangiatæ as amply justified by paleontological evidence, which also gives support to the classification of ferns by Bower on the basis of the development of the sorus and the output of the spores. In this, the division into Eusporangiate and Leptosporangiate is subordinated to the development of the sporangia with reference to time and place.

One of the most remarkable and significant results of paleontological research in recent years has been the recognition of the Cycadofilices as established by Potonié, thus forming a connecting link between the ferns and the Gymnosperms through the Cycads. Dr. Scott rightly places special stress upon an elucidation of the characters of this important group and shows:

1. That hitherto supposed forms of *Alethopteris*, *Sphenopteris* and *Neuropteris* types really represent the foliage of Cycadofilices.

2. The anatomical characters of the stem are in close agreement with those of the Cycadaceæ.

3. While the exact character of the fructification is not known with certainty, that which in all probability belongs to those plants is widely different from that of the ferns and approximates to that of the Cycads.

Poroxylon is shown to be a transitional form between the Cycadofilices and Cordaites through *Lyginodendron*. With respect to the Cordaites to which he deservedly devotes a large measure of space, he fittingly summarizes prevalent views respecting this most important group when he says that "Further investigation will doubtless modify greatly our conception of the Cordaites, and display a much greater variety

among the members of this family then we are at present prepared for. But whatever the future may have in store for us in this respect, there can be no doubt that the revelation of the existence of this fourth family of Gymnosperms was a discovery of the first magnitude, which reflects the greatest credit upon the investigators to whom it was due, and profoundly modifies our whole conception of an important sub-kingdom of plants."

Among the Mesozoic Cycadales, the genus *Bennettites* gains special prominence and importance, not only because of the great perfection with which important structures are preserved, but because of the character of the fructification and the relatively high development attained by these plants. The stem structure agrees closely with that of the Cycadaceæ, though representing a more primitive type. On the other hand, the fructifications of the two groups are totally different, and the greater complexity attained in the Bennettites points to a considerably higher degree of development. Thus in *B. Gibsonianus*, the seeds, many of which are to be found in a remarkable state of preservation, are dicotyledonous and exalbuminous, while the whole character of the fruit approximates to that of an Angiosperm. Here again we observe a repetition of that parallelism in development between various branches of the phylogenetic tree which was so well exhibited in *Cardiocarpus* and *Lepidostrobus*, and which goes far to sustain the idea so frequently suggested throughout the plant world, that in the general progress of development, the various branches are all extending forward in the same direction, whence arises a parallelism which indicates approximation to, without actual connection with, other yet higher phases of development; or, in other words, that deviation of a branch from the main line of descent involves certain inherent deficiencies which, while permitting development in the same general direction, impose a definite limitation of such a nature that the phylum is incapable of further variation, and hence can not extend beyond a limit which is always much inferior to that attained by the main line.

The work throughout affords one of the best evidences among recent contributions of the

primary importance of anatomical characters as the basis of true relationship, and this book will do much toward dissipating the older and altogether fallacious idea that a classification of fossil plants based upon external characters alone is possessed of permanent value. While the external forms of plants or their parts may possess a certain value for taxonomic purposes, such characters are in all probability least reliable in the case of fossils where they depend so largely upon the modifying influence of conditions under which the plant has been preserved. They are therefore oftentimes most misleading, and although we may admit their general value as a provisional means of classifying remains which cannot be otherwise distinguished, they possess no scientific merit and should be abandoned as fast as more accurate data become available.

That this book will do much to stimulate a more active interest in this important line of research we cannot doubt, but its mission will be well accomplished if it does no more than to finally convince botanists of their real dependence upon data derived from a study of the extinct forms of plant life.

D. P. PENHALLOW.

MCGILL UNIVERSITY,

Feb. 6, 1901.

A Contribution to the Study of the Insect Fauna of Human Excrement. By L. O. HOWARD. Proc. Washington Academy of Sciences, Vol. II., pp. 541-604. 2 pls.

A brief summary of the results obtained by Dr. Howard in his study of the insects affecting human excrement was given in the *Popular Science Monthly*, January, 1901. We have now before us the detailed work, in which the insects concerned are fully discussed and in many cases figured.

No resident of this country is likely to forget the deplorable outbreaks of typhoid fever which occurred in the military camps at the time of the war with Spain. It appears that every regiment in the United States service in 1898 developed typhoid, while more than 80 per cent. of the deaths in camp were due to this disease. This condition of affairs naturally aroused a great deal of popular anxiety and indignation, while medical men bestirred them-

selves to discover the exact causes of the spread of the fever. As a result, it came to be generally believed that flies had a great deal to do with the spread of typhoid bacilli, and one of the most prominent medical investigators concluded that 'flies undoubtedly served as carriers of the infection.'

Admitting, then, the agency of flies in the spread of typhoid fever and other ills, the question naturally arose, 'What flies?' This question the medical men did not pretend to answer, and the way was clearly open for an entomologist to supply the desired information. Dr. Howard, who loses no opportunity to make the Division of Entomology serviceable to the public, at once began an investigation which has now resulted in the publication of exact and minute details to take the place of supposition and vague surmise. Not only were the insects frequenting human excrement carefully watched and recorded, but feces were collected in great numbers, and the species breeding in them ascertained. As had been anticipated, flies were found in plenty; in fact, no less than 77 different species were obtained, of which 36 were actually found breeding in the feces. In addition to this, 23,087 flies were caught in kitchens and pantries in different parts of the country, in order to see how many of the kinds visiting or breeding in human excrement also visited places where food was kept, and were likely to crawl over the food. It appears that the flies most commonly found breeding in human excrement are not those which frequently enter dwellings, but there are several species which are likely to pass directly from the excrement to places where food is kept, and so become a dangerous source of infection. This is true of the common house fly (*Musca domestica*), the vinegar fly (*Drosophila ampelophila*), the stable fly (*Muscina stabulans*) and a number of others.

The practical conclusions reached by Dr. Howard should become known to all municipal authorities. It is shown that human excrement is much more dangerous to the public health than dead animals or other refuse. Every care should be taken to provide for its removal from those places where flies can gain access to it, and those depositing it in by-ways and vacant

lots should be severely punished. It seems to the present writer that the excrement nuisance, which now appears in a new and more serious light, cannot be got rid of until city authorities see their way to provide places of public convenience in every ward, so that no one need resort to either the alleys or the saloons to obey the dictates of nature. Dr. Howard has, indeed, provided the municipal reformer with a new and valuable argument, which it is to be hoped he will not fail to use.

From the standpoint of scientific entomology Dr. Howard's paper is of much interest. It records for the first time the breeding habits of a large number of insects, and also adds greatly to our knowledge of their distribution. Three species of flies proved to be new to science; these have been described by Mr. Coquillett in *Entomological News*, January, 1901.

In all the work Dr. Howard was ably assisted by several members of his office force, particularly Messrs. Pratt and Coquillett. To these careful credit is given, in accordance with Dr. Howard's invariable custom. The figures are numerous and clear, 25 species being illustrated, often with the early stages. By some slip, *Drosophila ampelophila* is called '*ampelophaga*' on the plate, but the name is given correctly in the text. *Limosina albipennis* and *L. crassimana*, to judge from the figures, should belong to different genera.

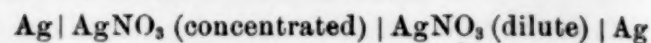
T. D. A. COCKERELL.

BOOKS RECEIVED.

- Les phénomènes électriques et leurs applications.* HENRY VIVAREZ. Paris, Georges Carré et C. Naud. 1901. Pp. vi + 574.
- A Laboratory Guide in Elementary Bacteriology.* WILLIAM DODGE FROST. Madison, Wis., published by the Author. 1901. Pp. viii + 205.
- Ausgewählte Methoden der analytischen Chemie.* A. CLASSEN. Braunschweig, Friedrich Vieweg und Sohn. 1901. Vol. I. Pp. xx + 940.
- Essays in illustration of Astral Gravitation in Natural Phenomena.* WILLIAM LEIGHTON JORDAN. New York and Bombay, Longmans, Green & Company. 1900. Pp. xiv + 192.
- General Report of the Investigations in Porto Rico of the United States Fish Commission Steamer Fish Hawk in 1899.* BARTON WARREN EVERMANN. Washington Government Printing Office. 1900. Pp. vi + 350, and 50 Plates.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Physical Chemistry. December. 'Reaction Velocity and Equilibrium,' by Wilder D. Bancroft; 'Differences of Potential between Metals and Non-aqueous Solutions of their Salts,' II, by Louis Kahlenberg. A formula has been deduced by Nernst for the E. M. F. of a galvanic chain of the type



which shows a fair degree of agreement with the observed values when water is used as a solvent. The author has tested the formula experimentally in a number of cases in which non-aqueous solutions are used, and finds that Nernst's formula does not hold good under these circumstances; 'Solvent Action of Vapors,' by A. T. Lincoln. A study of the solvent action of the vapor of water, benzene and acetone upon salicylic and benzoic acids, and of alcohol vapor upon camphor and naphthalene.

January. 'Gas Polarization in Lead Accumulators,' by C. J. Reed; 'Two Devices for Circulating Liquids at a Constant Temperature,' by Ira H. Derby; 'On the Equilibrium of Chemical Systems,' by Paul Saurel. The translation of the more important parts of a thesis of the same title, presented to the Faculté des Sciences of Bordeaux.

THE first (January) number of Volume II. of the *Transactions* of the American Mathematical Society contains the following papers: 'Invariants of Systems of Linear Differential Equations,' by E. J. Wilczynski; 'Divergent and Conditionally Convergent Series whose Product is Absolutely Convergent,' by Florian Cajori; 'Sets of Coincidence Points on the Non-Singular Cubics of a Syzygetic Sheaf,' by M. B. Porter; 'Note on Non-Quaternion Number Systems,' by W. M. Strong; 'On the Reduction of the General Abelian Integral,' by J. C. Fields; 'Ueber Flächen von Constanten Gauss'scher Krümmung,' by David Hilbert; 'Note on the Functions of the Form $f(x) \equiv \phi(x) + a_1x^{n-1} + a_2x^{n-2} + \dots + a_n$ which in a given Interval differ the least possible from Zero,' by H. F. Blichfeldt.

THE February number of the *Bulletin* of the American Mathematical Society contains the fol-

lowing papers: 'Report of the Annual Meeting of the Society,' by the Secretary; 'On Some Birational Transformations of the Kummer Surface into Itself,' by Dr. J. I. Hutchinson; 'Theorems concerning Positive Definitions of Finite Assemblage and Infinite Assemblage,' by Mr. C. J. Keyser; 'Dini's Method of showing the Convergence of Fourier's Series and of other Allied Developments,' by Mr. Walter B. Ford; 'Shorter Notices'; 'Fehr's Application of the Vectorial Analysis of Grassmann to the Infinitesimal Geometry,' by Mr. E. B. Wilson, and 'The Annuaire du Bureau des Longitudes,' by Professor E. W. Brown; 'Notes'; 'New Publications.'

The Plant World for January comes in a new and improved garb externally and internally. The first article, by Alice Carter Cook, entitled, 'Some Filipino Botany' comprises some curious extracts from Blanco's 'Flora.' C. F. Saunders contributes 'Hints for Beginners in the Determination of Grasses,' and an excerpt from Bulletin 28, Division of Forestry, discusses 'The Threatened Destruction of the Big Trees of California.' E. M. Williams describes 'The Rosy Tricholoma' and C. L. Pollard in the supplement continues 'The Families of Flowering Plants,' treating of various families of the orders Polygonales and Centrospermæ.

The American Naturalist for February is a particularly strong number in spite of the absence of 'Editorial Comment and Reviews.' It opens with a long and critical review of 'Scharff's History of the European Fauna' by Leonhard Stejneger, Scharff's work being praised for its admirable suggestiveness and treatment of the subject, though Dr. Stejneger combats, we think successfully, his advocacy of an invasion of Europe from North America by way of Greenland. B. Arthur Bensley discusses 'The Question of an Arboreal Ancestry of the Marsupialia and the Interrelationships of the Mammalian Subclasses,' considering that in spite of all evidence presented, Huxley's theory of a genetic succession of the former representatives of the Monotremata, Marsupialia and Placentalia is still entitled to first consideration. Arnold E. Ortmann briefly reviews 'The Theories of the Origin of the Antarctic Faunas and Floras,'

stating that he accepts Hooker's general idea of the former existence of land connection between the southern portions of existing continents. Oldfield Thomas writes of 'The Generic Names *Myrmecophaga* and *Didelphis*,' claiming that the former name justly belongs to the Great Ant-eater and *Didelphis virginiana* to the Virginia opossum. The species *cinereus* and *alstoni* he considers as members of the genus *Marmosa*. Finally Edwin C. Eckel presents 'The Snakes of New York; an Annotated Check List,' giving twenty-five species and subspecies, this being the first paper on the ophidian fauna of New York since Baird's 'Serpents of New York.'

Numbers 62 to 66 of the interesting *Communications from the Physical Laboratory at the University of Leiden* have been received in this country. The preceding numbers of the series are mainly in English. These numbers are in German except No. 65, which is in French. All are reprints from the *Livre jubilaire dédié à M. Prof. Lorentz*.

THE MACMILLAN COMPANY, agents of the New York University Press, will publish early in March, the first number of a scientific quarterly under the title *New York University Bulletin of the Medical Sciences*, edited, under the auspices of the New York University Medical Society, by an editorial committee consisting of B. Farquhar Curtis, M.D., Robert J. Carlisle, M.D., E. K. Dunham, M.D., John A. Mandel and William H. Park, M.D.

SOCIETIES AND ACADEMIES.

ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 315th meeting of the Anthropological Society was held on February 12th. Mr. Paul Brockett gave a short paper on 'Ancient Mexican Books,' and exhibited a copy of the Borgian Codex, lately reproduced through the munificence of the Duc de Loubat. With the codex was shown a Japanese book, illustrating the similarity in methods of folding. 'The Unwrapping of a Peruvian Mummy,' by W. H. Holmes and Walter Hough, proved interesting. A mummy pack from Peru was divested of its wrappings and from the swathings of cotton-bolls, leaves and cloth were taken the skeletons

of an adult and two infants. With the bodies were fabrics, pottery, gourds, a basket of two compartments containing a thorn needle, thread, red pepper and spinning apparatus. The presentation was further illustrated with plates from Reiss and Stübel's 'Necropolis of Ancon.'

W. H. Holmes presented a valuable paper on 'The Peopling of America,' in which a wide range of topics was discussed and illustrated by diagrams. It was aimed especially to bring forward the various problems involved in the new light thrown upon them by recent geological research. The biological problems were presented with the aid of a diagram outlining the history of the species and fixing the apparent position of the American people among the races of the world. Problems of chronology were elucidated by means of a diagram in which the genetic tree of the hominidæ was made to traverse the geologic time scale. Taking root in Tertiary times, the human stem is believed to have sent out four or more branches during Glacial and post-Glacial times, the latter period probably witnessing the specialization of the present American branch. The various views with respect to the geographical position of the cradle of the race were reviewed, and distribution and differentiation were discussed. Preference was given to the view that the eastern rather than the western continent was the original home of the group.

In the fourth section, the bridges and ferries by means of which America could have been occupied were passed in review, and the conclusion was reached that, so far as the present populations are concerned, they must have arrived by way of Bering Strait and that they were thus necessarily of Mongolian stock. Possible interference of the glacial ice sheet was considered, and the probabilities of pre-Glacial, inter-Glacial, and post-Glacial migration weighed.

The seventh section dealt with migration and the laws that govern movements of faunas and peoples, and the effects of movements of human groups from Asia to America by Bering Strait upon somatic and cultural conditions were carefully presented.

The eighth section included a comparative

study of American culture with reference to questions of origin; and the concluding section presented the archeological and paleontological evidence with the view of determining, as far as possible, its bearing upon questions of time, people and culture. It appeared that, although many phases of the investigation are yet in the speculative stage, comparative anthropology and geology are gradually but surely bringing order out of chaos.

Major Powell, in discussing Professor Holmes's paper, urged strongly that the tendency in culture development is toward integration and not toward differentiation. He pointed out that the number of languages in America evidences a low culture status, and affirmed that a similarly low status had been observed among certain tribes of Indians, as to artifacts. These remarks were in support of Major Powell's hypothesis that the precursor of man entered America destitute of speech and arts and at a period when Alaska was a land area coincident with Asia.

Mr. McGee said, in reference to the chronology of the hominidæ, he would place the precursor well down in the Glacial period, when the change began from divergence to integration. He said that development is by that process, and instead of representing the races by a number of radiating lines, he would show the divisions of the human race by converging lines developing toward unity.

Professor O. T. Mason, whose work on these problems is well known, was unfortunately unable to be present.

WALTER HOUGH.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 334th meeting was held on Saturday evening, February 9th. H. C. Oberholser spoke on the subject of 'A Naturalist in the Catskills,' describing at some length the topography of the region, the character of the vegetation and the more prominent birds and mammals, illustrating his remarks with numerous lantern slides. The remainder of the evening was devoted to a continuation of the discussion of the question of previous land connections between Asia and North America. Theo. Gill reviewed the evidence presented by the fossil mammals and existing fishes, saying that there

had not been one, but several land connections between the continents during the past.

Vernon Bailey said that nine species and subspecies of voles inhabiting the islands, coast and barren grounds of Alaska, belong to a well-defined group in the subgenus *Microtus* not represented elsewhere in America, but largely represented in Siberia and Northern Europe, *M. aperazius* of St. Michaels, for example, being closely related to *M. arvalis* of Europe. Among the red-backed voles *Eutamias alascensis* of the barren grounds of Alaska is much more nearly related to *E. rutilus* of northern Siberia and Europe than to any other American species. As these animals were small and weak and must therefore travel and spread slowly, he concluded that they could not have crossed over an ice bridge, but that their affinities pointed to a comparatively recent and somewhat extended, in point of time, land connection.

F. A. LUCAS.

THE NEW YORK SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE monthly meeting of the New York Section of the American Chemical Society was held on February 8th at the Chemists' Club, 108 West Fifty-fifth street.

Dr. T. C. Stearns read a paper on 'The Chemistry of Materials used in Perfumery and Kindred Arts,' in which he described the methods of preparation and chemical relations of the essential odors of flowers and their synthetic imitations.

In the discussion it was suggested, and by some maintained, that the effect of the synthetic preparations was harmful to the human system, but nothing whatever in the way of proof was adduced.

Dr. C. W. Volney gave the results of his investigation of the 'Decomposition of the Chlorides of the Alkali Metals by Sulfuric Acid,' with exhibition of crystals, which he considered polysulphates, the most important being the trisulphate. Some of those present thought these salts were probably acid sulphates, with sulfuric acid of crystallization, and that even the thermal evidence was in support of this explanation.

A paper by Dr. H. T. Vulté and Harriet W. Gibson on the 'Metallic Soaps from Linseed Oil; an Investigation of their Solubilities in certain of the Hydrocarbons,' was read by Dr. Vulté. Professor Sabin said that a great many of the driers in use were made from rosin and contained no linseed soaps at all. Dr. Dudley said that he knew of no subject needing more study than the chemistry of the drying of oil, and that a great deal of time had been spent on it in his laboratory. He found that oil driers used in excess retard drying, but that gum shellac driers could be used in all proportions and drying would occur approximately in proportion to the drier used. He had also found that a lead and manganese drier could be prepared which would induce drying of linseed oil in two hours.

H. C. Sherman and J. F. Snell were represented by H. C. Sherman, who read a paper in two sections: (a) 'On the Heat of Combustion as a Factor in the Analytical Examination of Oils'; (b) 'The Heats of Combustion of some Commercial Oils.'

It was shown that in the case of a drying oil exposure to the air produced a reduction in the heat of combustion which may amount to ten per cent., whereas lard oil with the same exposure lost only one per cent. of its heat of combustion.

To ignite the oil in the bomb calorimeter it was found satisfactory to absorb it on asbestos wool, whereby the use of any special igniting substance, with its consequent introduction of a troublesome error, was entirely obviated.

DURAND WOODMAN,
Secretary.

THE WESTERN PHILOSOPHICAL ASSOCIATION.

THE Western Philosophical Association held its first annual meeting at the University of Nebraska, Lincoln, on January 1st and 2d. The program was as follows:

Greetings—Chancellor E. Benjamin Andrews, University of Nebraska.

President's Address—'The Theory of Interaction'—Frank Thilly, Professor of Philosophy, University of Missouri.

'The Dominant Conception of the Earliest Greek Philosophers'—Frederick J. E. Woodbridge, Professor of Philosophy, University of Minnesota.

Discussion led by Arthur Fairbanks, Professor of Greek, University of Iowa.

'Martineau's Heredity and Philosophy'—Rev. J. R. Brown, of Kansas City.

Discussion led by C. B. McAfee, Professor of Philosophy, Park College.

'The Psychology of Profanity'—G. T. W. Patrick, Professor of Philosophy, University of Iowa.

Discussion led by D. D. Hugh, Professor of Psychology, State Normal School, Colorado.

'The Postulates of the Psychology of Style'—J. D. Logan, Professor of Philosophy, University of South Dakota.

Discussion led by L. A. Sherman, Professor of English Literature and Dean of the College of Arts, University of Nebraska.

'Some Philosophical Problems of the Present Time'—An informal address by J. E. Creighton, Professor of Logic and Metaphysics, Cornell University, and editor of the *Philosophical Review*.

'The Primacy of Will'—Edgar L. Hinman, Adjunct Professor of Philosophy, University of Nebraska.

Discussion led by W. M. Bryant, of St. Louis.

'The Psychology of Imitation'—T. L. Bolton, Instructor in Psychology, University of Nebraska.

Discussion led by H. Heath Bawden, Instructor in Philosophy, University of Iowa.

'The Theory of Imitation in Social Psychology'—C. A. Ellwood, Assistant Professor of Sociology, University of Missouri.

Discussion led by A. Ross Hill, Professor of Philosophy, University of Nebraska.

The meeting next year will be at the University of Iowa under the presidency of the University of Iowa.

DISCUSSION AND CORRESPONDENCE.

CROCODILIAN NOMENCLATURE.

MR. WILLIAM J. FOX (SCIENCE, February 8, 1901, p. 232) in maintaining that the name *Lacerta crocodilus*, given by Linnæus, has become restricted to the Nile crocodile by its exclusive use for the latter in Hasselquist's 'Reise,' 1762, has apparently overlooked the fact that the types of *Lacerta crocodilus* are still in existence. It has been shown both by Dr. Lönnberg and Mr. Andersson that the specimens which served Linnæus as types for his descriptions belong to the species which is commonly known as *Caiman sclerops*. As the generic name of the latter is also untenable, the species will stand in the future as *Jacaretinga*

crocodilus (Linnæus), while the name of the crocodile of the Nile remains as before: *Crocodylus niloticus* Laurenti.

LEONHARD STEJNEGER.

U. S. NATIONAL MUSEUM,

Feb. 16, 1901.

SHORTER ARTICLES.

STRATIGRAPHICAL NOTE.

IN SCIENCE, N. S., Vol. XIII., No. 317, January 25, 1901, p. 135, I notice that the order in which the proposed names of the geological formations occurring in the Devonian and Silurian of Antigonish County, Nova Scotia, is given, might lead to a misapprehension of the natural succession of the strata in question. I have much pleasure in drawing attention to the following notes on the names suggested and characteristics of the five geological formations as they appear, in descending order, as follows:

Devonian.

1. THE KNOYDART FORMATION. (Knoydart being the name of a settlement and brook in the vicinity of McArras brook, where this formation is well developed. The word is pronounced as if spelt Kroydiart.)

The Knoydart formation consists of red shales and sandstones, marls and tufaceous strata holding pteraspidian and cephalaspidian fishes associated with crustaceans whose affinities are close to a number of forms described from the Cornstone or Lower Old Red Sandstone of Great Britain, especially as developed in Herefordshire.

This Knoydart formation is thus referred to the 'Old Red Sandstone' or Devonian System.

Silurian.

Unconformably (?) below the Knoydart formation we find just east of the mouth of McArras Brook and along the south shore of Northumberland straits at this point, Silurian strata, holding marine organisms, which may be provisionally divided into four distinct formations.

2. THE STONEHOUSE FORMATION. This consists for the most part of dark red thin-bedded, fine-grained, shales or mudstones with a conspicuous and abundant lamellibranchiate fauna,

of which *Grammysia Acadica*, Billings, is a well-known species, together with a number of interstratified, more or less, calcareous band-holding brachiopoda, gastropoda, trilobites and ostracods in abundance.

3. THE MOYDART FORMATION (pronounced Mōdiart). This consists for the most part of heavy-bedded, light greenish gray and rusty, or buff-weathering, calcareous strata (in which the 'Red Stratum' of authors occurs) and holds a conspicuous fauna of brachiopods, trilobites, annelids, cephalopods, crinoids, etc. It is followed downward by

4. THE MCADAM FORMATION, which is characterized by dark gray or black fine-grained carbonaceous and oft times splintery shales holding a lamellibranchiate fauna in the upper half of the shale and graptolites in the lower half.

A number of thin lenticular sheets of impure light gray limestone abound in brachiopoda.

5. THE ARISAIG FORMATION. At the base of the Silurian succession, along the Arisaig shore, there occur buff-weathering fine-grained and compact indurated sandstones and shales holding corals (chiefly *Streptelasma*) brachiopods, trilobites, gastropods, etc. These are associated with black carbonaceous and graptolitic shales. The term *Arisaig formation* is suggested and proposed for the lowest Silurian horizon or formation in the section as developed at Beech-hill Cove. The term *Silurian* is here used in the restricted sense as equivalent to the Upper Silurian of Murchison. These formations tabulated would give the following arrangement :

System.	Formation.	Strata.
Devonian.	Knoydart.	Red shales and sandstone, marls and gray sandy shales with tufaceous layers.
Silurian.	Stonehouse.	Red shales and mudstones, with occasional thin bands of limestone.
	Moydart.	Greenish-gray and whitish colored impure limestones.
	McAdam.	Black carbonaceous shales and mudstones.
	Arisaig.	Buff-weathering sandy shales and sandstones, calcareous layers and black carbonaceous shales.

The amount of unconformity, if any, between the Stonehouse and Knoydart formations, *i. e.*, between the Devonian ('Old Red Sandstone') and the Silurian is a point of considerable importance and interest which will receive careful attention. H. M. AMI.

INFLUENCE OF LIGHT ON THE LENGTH OF THE HYPOCOTYL IN INDIAN CORN.

It is well-known that in vegetating plants of Indian corn, wheat and other cereals, the first node of the stem is found near the surface of the ground, regardless of the depth at which the seed was planted. If the seed is deeply planted, the hypocotyl elongates above the seed proportionally lifting the node almost to the surface. If the seed is planted shallow, on the other hand, the node is found at about the same depth.

That the checking of the elongation of the hypocotyl is due to the influence of light is strikingly shown by an experiment recently conducted in the laboratory of the Wisconsin Agricultural College. Kernels of Indian corn were planted by a number of students in galvanized iron seed pans nearly filled with garden loam, after which the pans were kept covered with close-fitting tin covers until the plantlets began to appear when the covers were removed.

In all plantlets which appeared above the soil before the cover of the seed pan was removed, the first node is above the soil, as is clearly shown by the fact that this node bears the cotyledon, while in those that have since appeared, the first node is just at the surface or below it. E. S. GOFF.

UNIVERSITY OF WISCONSIN.

CURRENT NOTES ON PHYSIOGRAPHY.

ALLEGANY COUNTY, MARYLAND.

THE first volume of a new series of county reports just begun by the Maryland geological survey gives an excellent description of Allegany county, which occupies a central position in the three western mountainous counties. Among nine chapters, treating subjects that range from geology and soils to climate and forests, the physiography of the county is described by C. Abbe, Jr. The three cycles of erosion, characteristic of a great stretch of the

Appalachians, are signalized; the first having witnessed the obliteration of the ancient mountains of deformation in the production of an extensive peneplain; the second, introduced by general uplift, sufficing to produce strips of peneplain on the weaker rocks, but leaving the harder rocks so little worn that their skylines suffice to guide the restoration of the earlier plain; the third, introduced by an uplift of less amount, a relatively brief episode up to to-day, inasmuch as it has permitted only the erosion of narrow valleys in the floor of the weak-rock intermont peneplains. Pauses in the later uplift are indicated by rock terraces on the sides of the young valleys; the recency of the latest uplift is proved by the occurrence of ungraded riffles of hard rock in the beds of the larger streams. The meandering courses of the young valleys in their longitudinal parts are thought to have been inherited from free meanders developed on the open floors of the intermont peneplains, before their upheaval. Several examples of stream adjustment are presented. The report includes many excellent plates; the view of Cumberland and the notch in the even-crested Wills mountains being most characteristic of Allegheny scenery. The report is accompanied by an excellent atlas of six maps; three delicately contoured topographic sheets; and three with an overprint of geologic colors on the topographic base.

The author of the above chapter remarks that the modern method of studying the topography of a district 'seeks, from a study of the outward forms, to discover the reasons for their existence and the processes by which they have been produced. * * * The present physiographic study of Allegany county aims to so present its topography and topographic development as to make clear the reasons why the county has the surface features which characterize it.' A somewhat different wording would have expressed a shade of meaning which is believed to be more appropriate to a physiographic chapter, namely, 'this physiographic study of — county presents the reasons for the existence of the local topographic forms and the processes by which they have been produced in order that the forms themselves, as they now exist, shall be better

known.' The processes of the past are in themselves essentially of a geological nature; they gain a relation to physiography only when they illuminate the facts of the present. Their value to the physiographer lies in the power that they give him to see and to describe the existing facts of topographic form, for physiography is essentially a study of present conditions.

THE PHILIPPINE ISLANDS.

G. F. BECKER contributes a 'Brief Memorandum on the Geology of the Philippine Islands' (20th Ann. Rep. U. S. Geol. Surv., pt. ii, 1900, 1-7), which gives another kind of illustration of the point just made regarding the illumination of the present by the past.

Although strictly geological in having to do with past process and time, the essay has a great physiographic value in aiding the imagination to build up a conception of present forms. A strong deformation and uplift of Eocene and older strata was followed by extensive denudation. This was later accompanied by depression, which reduced a large land area to a group of small hilly islets. Volcanic eruptions, making vast additions of material to their denuded and submerged foundation, began during this submergence; then came a general emergence which, with eruptions, has continued ever since; Mayon, one of the most symmetrical cones in the world, having had a violent eruption in 1897. The emergence of the region has revealed coral deposits of the shore waters, which make nearly continuous mantles far up the land slopes, even to altitudes of 2,000 feet. Pauses during uplift allowed the waves to carve sea cliffs and benches, which now take the form of terraces, more or less dissected, as one of the most prominent topographical features of the islands. The last hundred feet of uplift have revealed extensive lowlands, the most valuable part of the archipelago. Considerable areas have been added in deltas, where the mangrove and the nipa palm aid in the deposition of river sediments.

OVERDEEPEINED ALPINE VALLEYS.

KILIAN, of Grenoble, dissents from the opinion that the overdeepening of glaciated Alpine valleys and the associated discordant mouthings

of the hanging lateral valleys are results of glacial erosion. He concludes that the lateral valleys are the remains of an ancient topography in which the trunk and the branch valleys were accordant; that the lateral valleys, long occupied by névé and ice, have been preserved from erosion, while the trunk valley has been deepened chiefly by stream action during interglacial and postglacial epochs. Overdeepened valleys when thus interpreted are witnesses rather to the conservative action of glaciers than to their destructive action (Note sur le surcreusement ('Uebertiefung') des vallées alpines. C. R. Soc. géol. France. Dec. 17, 1900, 160-162). W. M. DAVIS.

BOTANICAL NOTES.

ELLIOTT'S GRASSES.

THOSE who are fortunate enough to possess a copy of Stephen Elliott's rare two-volume work entitled 'A Sketch of the Botany of South Carolina and Georgia' will be glad to know that Professor Scribner, of the Division of Agrostology of the United States Department of Agriculture, has published a circular (No. 29) giving the results, so far as the grasses are concerned, of a critical examination of Elliott's Herbarium, now in the possession of the College of Charleston, South Carolina. He has been able in this way to verify Elliott's determinations, and to make necessary corrections, the latter due to the fact that in many cases the species had been named previously by foreign botanists, and, also, that many changes in nomenclature have occurred in the eighty or more years which have elapsed since the publication of Elliott's 'sketch.' This herbarium is said to consist of twenty-eight volumes of folios, twelve by twenty-three inches in size, and that part containing the grasses is described as in a 'very good state of preservation.' It is curious that in working over the species, the author (who was assisted by Mr. E. D. Merrill) found it necessary to describe two or more species, viz., *Panicum amaroides* (to be separated from Elliott's *P. amarum*, and hitherto known as *P. amarum minor* Vasey), and *Panicum subbarbulatum* (the *P. barbulatum* of Elliott, but not the *P. barbulatum* of Michaux).

WOOD'S HOLL BOTANY.

THE announcement of the botanical work of the fourteenth season (1901) of the Marine Biological Laboratory, of Wood's Holl, Mass., has just been received. Dr. Bradley Moore Davis, of the University of Chicago, will be in charge again, as he has been for several years past. The session opens July 3d, and extends to August 14th. Work is offered along four lines, viz.: Cryptogamic Botany (algae or fungi, or both); Phanerogamic Botany (the outdoor study of flowering plants; Plant Physiology (experiments and lectures); and Plant Cytology (a laboratory course in methods). Lectures by specialists will be provided as in previous years. A special welcome will be accorded to investigators who desire to carry out special lines of research. Announcements giving further details may be obtained of Dr. Davis.

NEW SPECIES OF NORTH AMERICAN TREES.

IT will surprise many readers to learn that critical botanists have recently discovered many hitherto undescribed species of North American trees. In the January number of the *Botanical Gazette*, Professor C. S. Sargent discusses 'New and Little Known North American Trees,' in which he describes seven new species, viz.: *Gleditsia texana* (a tree one hundred to one hundred and twenty-five feet high, and two and a half feet in diameter, from the valley of the Brazos river, Texas); *Crataegus engelmanni* (fifteen to twenty feet high, and closely related to *C. crus-galli*, from Missouri to Alabama); *Crataegus canbyi* (twenty to twenty-five feet high, also related to *C. crus-galli*, from Delaware); *Crataegus peariensis* (twenty to twenty-five feet high, from central Illinois); *Crataegus pratensis* (a small tree from central Illinois); *Crataegus submollis* (a large tree hitherto confounded with *C. mollis*, from Maine to Montreal and Massachusetts); *Crataegus dilatata* (a small tree related to *C. coccinea*, from Vermont, Massachusetts and Rhode Island); *Crataegus coccinea rotundifolia* (the *C. rotundifolia* of Moench, one of the commonest of New England forms); and *Crataegus jonesae* (a small tree closely related to *C. coccinea*, from southeastern Maine). Ashe's species, *C. holmesiana*, from Quebec and Ontario to Maine, Massachusetts, New York

and Pennsylvania, is redescribed, as also the original Linnæan *C. coccinea*.

In the February number of *Rhodora* the same author describes thirteen new species of *Crataegus* from the Champlain Valley, principally in the neighborhood of Middlebury, Vermont. The species described are the following: *C. champlainensis* and *C. pringlei*, both of the section 'Molles'; *C. lobulata* (of the section 'Flabellatae'); *C. acutiloba*, *C. matura*, *C. pastorum*, *C. pentandra* (all of the section 'Tenuifoliae'); *C. praecox*, *C. brainerdi* (of the section 'Coccineae'); *C. modesta* (of the section 'Intricatae'); *C. scabrida*, *C. egglesoni*, *C. asperifolia* (all of the section 'Anomalaе').

SELBY'S HANDBOOK OF PLANT DISEASES.

PROFESSOR A. D. SELBY, of the Ohio Agricultural Experiment Station, has just issued as a bulletin (No. 121) a very valuable pamphlet of seventy pages entitled 'A Condensed Handbook of the Diseases of Cultivated Plants in Ohio.' It discusses in non-technical language the nature of disease, the structure and habits of parasitic fungi, and then takes up alphabetically the cultivated plants of the farm and garden, describing under each the diseases and their effects. Woodcuts are freely used to help the descriptions. A couple of pages are given to formulæ and directions for making different fungicides, and the pamphlet closes with a very suggestive 'spray calendar.' This bulletin must prove to be very useful to the farmers and gardeners of Ohio, and it will be found most helpful, also, to all who are studying the diseases of plants.

CHARLES E. BESSEY.

UNIVERSITY OF NEBRASKA.

SCIENTIFIC NOTES AND NEWS.

GOVERNOR STONE, of Pennsylvania, has appointed Dr. J. T. Rothrock forestry commissioner under the new act, which places the forestry interests of Pennsylvania under the charge of a separate department of the State Government.

GOVERNOR ODELL, of New York, has appointed Dr. Daniel Lewis, of New York City, State Health Commissioner. Dr. Lewis was

president of the State Board of Health which has been abolished.

DR. W. W. KEEN, professor of surgery in the Jefferson Medical College, Philadelphia, expects to spend next year in a trip around the world.

PROFESSOR JOHN GRIER HIBBEN, of Princeton University, has returned from his trip abroad and has resumed his work in the University.

THE Institution of Naval Architects has awarded a gold medal to Professor G. H. Bryan, F.R.S., for his paper on 'Bilge Keels.'

It is stated in *Nature* that the Brussels Academy of Sciences has awarded a gold medal, of the value of six hundred francs, to M. F. Swarts, for a memoir on the subject of carbonates of an element the compounds of which are little known. A similar award has been made to Professor J. Massart, for a memoir on the nucleus of Scizophytes, and the Edouard Mailey prize of one thousand francs, for assistance in the extension of the knowledge of astronomy in Belgium, has been awarded to M. F. Jacobs, the founder of the Société Belge d'Astronomie.

WE also learn from *Nature* that Mr. Vaughan Cornish, whose name is closely associated with the wave-like forms assumed by drifted materials, is now engaged on the Canadian prairies photographing and studying the forms assumed by drifting snow. Thanks to the liberality of the Canadian Pacific Railway Company and the interest evinced in the investigation by Sir William van Horne, Mr. Cornish writes that his work proceeds satisfactorily, and enough has already been done to justify the expedition.

PROFESSOR ERNST HAECKEL is expected to return from Java to the University of Jena at the beginning of the summer semester, when he will resume his regular lectures.

MR. SAMUEL HENSHAW, who has been head gardener of the New York Botanical Garden since its establishment, has resigned on account of advancing years, but is to act as adviser when his services are needed.

DR. F. BIDSCHOF, of the Observatory in Vienna, has been appointed assistant in the Observatory at Trieste.

THE Royal Swedish Academy of Sciences will celebrate the tercentenary of the death of Tycho Brahe by a special session on October 24th. The Academy has also undertaken to issue a facsimile reproduction of the astronomer's great work, 'Astronomiæ Instauratæ Progymnasmata,' which was printed under the author's direction and of which but five copies are known to exist.

THE death is announced of Dr. Robert Pöhlmann, the geologist, curator in the Natural History Museum at Santiago, Chili.

DR. OSCAR SCHLÖMILCH, formerly professor of mathematics at the Technical School at Dresden, died on February 7th, at the age of seventy-eight years.

MR. MAURICE THOMPSON, the eminent poet, critic and novelist, who died recently, did good work as a naturalist. He was originally a civil engineer and was at one time State geologist of Indiana.

ADVICES have been received from Para, Brazil, regarding the death of Dr. Walter Myers, of the expedition from the Liverpool School of Tropical Medicine. The attack of yellow fever followed a prolonged autopsy and Dr. Herbert Durham also contracted the disease. As cable advices to the contrary have not, however, been received, it may be assumed that he recovered.

A CIVIL SERVICE examination will be held on March 26th to fill the position of nautical expert in the hydrographic office, Navy Department, at a salary of \$1,000 per annum. The examination will be in pure mathematics, physical geography and navigation.

THE Department of State has received a note from the legation of Sweden and Norway, dated Washington, February 2, 1901, stating that the managers of the Nobel fund have been authorized to correspond directly with interested parties abroad without using the channel of the Ministry of Foreign Affairs at Stockholm.

THE London correspondent of the New York *Evening Post* cables that an extensive collection of Central American land fresh-water shells has been presented to the Natural History Mu-

seum by Mr. Frederick Godman, F.R.S. There are nearly 10,000 specimens, including types of 70 new species. Mr. Godman also presented a large and important collection of butterflies of Central America, containing 2,500 specimens.

THE Paris Academy of Sciences has decided to award annually in memory of Lavoisier a gold medal for distinguished services to chemistry.

THE fifteenth free lecture course of the Field Columbian Museum of Chicago will be given on Saturday afternoons at three o'clock, as follows:

March 2—'The Kiowa Indians—A Typical Buffalo Tribe,' by James Mooney, Bureau of Ethnology, Washington, D. C.

March 9—'The Hills and Valleys of Wisconsin and their Life History,' by Dr. E. R. Buckley, Wisconsin Geological and Natural History Survey.

March 16—'The Diamonds of the Kettle Moraine and their ancestral Home,' by Professor William H. Hobbs, University of Wisconsin.

March 23—'The Evolution of Means of Transportation in America,' by Professor Edwin Erle Sparks, University of Chicago.

March 30—'Some Interesting Insects,' by Mr. Edward Benjamin Chope, Assistant in Department of Zoology, Field Columbian Museum.

April 6—'Deep Sea Fishing and Fishes,' by Dr. S. E. Meek, Assistant Curator, Department of Zoology, Field Columbian Museum.

April 13—'The Ancient Pueblos of Arizona,' by Dr. J. Walter Fewkes, Bureau of Ethnology, Washington, D. C.

April 20—'Tour of the Plant World—West Indies,' by Dr. Charles F. Millspaugh, Curator, Department of Botany, Field Columbian Museum.

April 27—'Jamaica—The Princess of the Antilles,' by Dr. Charles F. Millspaugh, Curator, Department of Botany, Field Columbian Museum.

THE second annual banquet of the Sigma Xi Society of the University of Nebraska was held in connection with charter day and mid-winter commencement on February 14th. Afterwards an address was made before the Society by Professor C. C. Nutting, of the University of Iowa, his subject being 'The Conditions of Life at the Bottom of the Sea.'

DR. C. HART MERRIAN, chief of the Biological Survey, lectured before the Linnean So-

ciety of New York on February 28th, his subject being 'The Naturalist on the Coast of Alaska.'

MR. N. C. MACNAMARA delivered the Hunterian Oration before the Royal College of Surgeons of England on February 14th, taking as his subject the form of the human skull in relation to the origin of pre-historic man in western Europe.

It is reported that there is a serious outbreak of the bubonic plague in the Khirgiz steppes of western Siberia. Many thousands are said to have already died. The spread of the plague at Cape Town gives apprehension lest the army may be affected, and rumors to this effect are already current.

THE last biennial report of the Illinois State Laboratory of Natural History indicates that some valuable investigations have been made in regard to the abundance, distribution and migration of Illinois fishes, their times and places of breeding, their feeding habits and their food preferences. Five stations have been established in the Illinois river for investigation, one in the Spoon river and three in the bottom-land lakes connected with the larger streams. Eighty species of fish were found near Havana, on the Illinois river, the families most characteristic of the region being catfish, suckers and sunfish. There are also a few very abundant species of other families, as the gar, dog-fish, gizzard-chad, yellow bass, sheepshead and carp. A considerable number of collections have been made by high school principals and science teachers and sent to the laboratory in aid of this survey. The laboratory collections of fishes for the last thirty years have been examined and catalogued and rearranged. The collections assorted to the present time are contained in 63 large copper tanks and in 2,827 jars and bottles. A beginning was made last summer in the preparation of colored plates for the report on the fishes of the State. Sixteen plates were finished during the summer, and the color drawings are accurate in detail, true to life in color, form and attitude. It is the purpose of Dean S. A. Forbes to have illustrated by such plates every species of fish found, and the result will be a more finished series of plates of

American fresh-water fishes than has ever yet been published.

UNIVERSITY AND EDUCATIONAL NEWS.

THE Chicago Institute of Pedagogy, endowed by Mrs. Emmons Blaine with, it is said, nearly \$2,000,000, has been united with the University of Chicago.

THROUGH Mr. Jonathan Bulkley, of New York, Yale University has received \$10,000 for the establishment of a fellowship in American history.

PRESIDENT MORLEY, of Fargo College, North Dakota, is making progress towards collecting the \$150,000 necessary to secure the pledge of Dr. Pearson, of Chicago, for \$50,000 before the end of the present year.

MR. ANDREW CARNEGIE has presented \$32,500 to the Iron and Steel Institute, London, for the foundation of a research scholarship.

THE troubles in the Russian universities appear to be serious, having spread from Kieff to St. Petersburg and Moscow. About 200 Kieff students have been compelled to serve in the army as a punishment for their objecting to one of the professors. It is reported that six of them have been shot for refusing to renew their oath of allegiance to the Czar, but this may be incorrect.

HOMER CHARLES PRICE, M.S., has been elected to the chair of horticulture and forestry at the Iowa State College of Agriculture and Mechanic Arts. At Wellesley College, Miss Margaret C. Ferguson, B.S., has been appointed instructor in botany and Roxanna H. Vivian, B.A., instructor in mathematics.

PROFESSOR FRANK THILLY, of the University of Missouri, asks us to state that there is no truth in the report that he had been called to the chair of ethics in Leland Stanford Junior University.

DR. F. PASCHEN, of the Technical Institute at Hanover, has been appointed full professor of physics in the University of Tübingen.

DR. FRANZ NISSEL, known for his work on the histology of the nervous system, has been promoted to an associate professorship of psychiatry at the University of Heidelberg.